2012

THREE ESSAYS CONCERNING THE RELATIONSHIP BETWEEN EXPORTS, MACROECONOMIC POLICY, AND ECONOMIC GROWTH

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Brandon James Sheridan, Student

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Dr. Aaron Yelowitz, Director of Graduate Studies

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THREE ESSAYS CONCERNING THE RELATIONSHIP BETWEEN EXPORTS, MACROECONOMIC POLICY, AND ECONOMIC GROWTH

DISSERTATION

A dissertation submitted in partial fulfillment of the
requirements for the degree of Doctor of Philosophy in the
College of Business and Economics
at the University of Kentucky

By

BrandonJames Sheridan

Lexington, Kentucky

Director: Dr. Jenny Minier, Professor of Economics

Lexington, Kentucky

2012

ABSTRACT OF DISSERTATION

THREE ESSAYS CONCERNING THE RELATIONSHIP BETWEEN EXPORTS, MACROECONOMIC POLICY, AND ECONOMIC GROWTH

This dissertation consists of three essays that collectively investigate the relationship between exports, macroeconomic policy and economic growth. The first essay investigates the relationship between disaggregated exports and growthto address why many developing countries rely on primary goods as their main source of export income when evidence suggests they could earn higher returns by exporting manufactured goods.Using regression tree analysis, I find that although increasing manufacturing exports is important for sustained economic growth, this relationship only holds once a threshold level of development is reached. The results imply that a country needs a minimum level of education before it is beneficial to transition from a reliance on primary exports to manufacturing exports.

Thesecond essay explores the impact of fiscal episodes on the extensive and intensive margins of exports for a sample of OECD countries. In general, a fiscal stimulus in an exporting country is associated with a substantial decrease in each margin. However, a fiscal consolidation in an exporting country is associated with a large increase in the extensive margin, yielding a positive net effect on total exports. This positive effect of a consolidation disappears when an importing country simultaneously experiences a fiscal episode. Overall, the effect of fiscal episodes on total exports and the export margins yield important ramifications for policy-makers.

The third essay takes a broad perspective in characterizing the relationship between disaggregated exports, macroeconomic policy, and economic growth. Few studies consider that macroeconomic policy may influence growth, at least partly, through the export channel and none consider that this impact may differ for primary and manufacturing exports. I first explore the determinants of disaggregated exports to empirically test whether macroeconomic policy influences the size of the export sector in a country. Second, I use simultaneous equations methods to identify the impact of macroeconomic policy and exports on economic growth. Indeed, there appears to be some evidence that macroeconomic policy may affect the level of exports.Moreover, exports appear to exert an influence on growth, but the role of macroeconomic policy in the growth process seems to be only through its influence on other variables.

KEY WORDS: exports, economic growth, fiscal policy, export margins, developing countries

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July 16, 2012

THREE ESSAYS CONCERNING THE RELATIONSHIP BETWEEN EXPORTS, MACROECONOMIC POLICY, AND ECONOMIC GROWTH

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1 Introduction

As our society becomes increasingly globalized, the economic growth path of any one particular country relies more and more on the success or failure of other countries, particularly that of trading partners. As such, this dissertation is comprised of three independent essays with a common theme – exports. The first essay explores potential nonlinearities in the relationship between disaggregated exports (manufacturing and primary) and economic growth. The second essay measures the response of the extensive and intensive margins of exports following a fiscal consolidation or fiscal stimulus in a given country. The third essay investigates the relationship between macroeconomic policy, exports, and economic growth.

1.1 Essay 1: Manufacturing Exports and Growth

The first essay specifically considers the relationship between disaggregated exports and growth, with the intent of addressing the following question: why do many developing countries still rely on primary goods as their main source of export income when evidence from previous studies suggests they could earn higher returns by exporting manufactured goods? In this context, primary products generally refer to that class of goods which undergo minimal processing before being exported. Examples include oil, minerals, and agricultural products such as cocoa and coffee. Manufacturing exports consists of goods with a much higher level of processing and technological content, such as electronics. Intuitively, countries that export, particularly those that export manufactured goods, are likely to benefit from positive externalities such as knowledge spillovers and economies of scale. Thus, participating in the international market allows a country to grow at a higher rate than would otherwise be possible. However, a country may need to be relatively developed before they are able to benefit from these positive externalities. Traditionally, a developed country is characterized as such based on its per capita income level. However, since development is multi-

faceted, I allow for several measures of development: income, investment, education, primary exports, and manufacturing exports. I use an endogenous sample-splitting technique known as regression tree analysis to allow the data to determine the appropriate measure of development and the location of the threshold. I find that although increasing manufacturing exports is important for sustained economic growth, this relationship only holds once a threshold level of development is reached. The results imply that a country needs to achieve a minimum level of human capital before it is beneficial to transition from a reliance on primary exports to manufacturing exports.

1.2 Essay 2: Fiscal Episodes and Export Margins

This essay explores the impact of fiscal episodes on the extensive and intensive margins of exports for a sample of OECD countries. Much of the existing literature on fiscal episodes examines the impact on economic growth of changes in tax rates versus changes in government spending, as in Alesina & Ardagna (2009). Differentiating between the various sources of fiscal stimuli or consolidations is outside the scope of the current paper. Instead, we use the fiscal episodes identified by Alesina & Ardagna (2009) and focus on how these episodes affect the margins of exports. The extensive margin is defined as the total number of products country h exports to country i and the intensive margin is the average volume per product of the exports from h to i. There are essentially two types of scenarios that are relevant from a policy standpoint, the first of which is much more common in the current dataset: 1) When a fiscal episode occurs in an exporting country, and, 2) When a fiscal episode occurs in both countries of a country-pair simultaneously. A consolidation in an exporting country results in a large increase in the extensive margin of over 16%, which yields a net increase in the total volume of exports of nearly 7%. For large fiscal consolidations, known as "successful" fiscal consolidations in this study, the increase in total exports is approximately 14.5% and is driven entirely by changes in the extensive margin.

Leigh *et al.* (2010) show that a decrease in interest rates usually follows a fiscal consolidation, meaning that countries may use a fiscal consolidation as a time to invest and expand their product lines. This is consistent with the finding in this essay of an increase in the extensive margin following a consolidation. Conversely, a fiscal stimulus in an exporting country results in a decline in the extensive and intensive margins, yielding a decrease in total exports of over 21%. If an importing country also undergoes an episode, the impact is fairly minimal on the cumulative effect of the export margins and total exports. The results do not shed light on the specific mechanism that is causing the change in exports, or which type of fiscal policy prompts a specific episode. However, since many governments are currently considering fiscal policy measures, these results should be taken into account when formulating those policies.

1.3 Essay 3: Macroeconomic Policy, Exports, and Economic Growth

Recent empirical studies offer mixed results on the impact of exports and macroeconomic policy – monetary policy and fiscal policy – on economic growth. This essay takes a relatively broad perspective in characterizing the relationship between exports, macroeconomic policy, and economic growth. Many existing studies look at the impact of exports on growth or the impact of certain macroeconomic policies on growth, but few consider that macroeconomic policy may influence growth, at least partly, through the export channel. Furthermore, none consider that this effect may differ for primary and manufacturing exports. Since exports are vitally important to a country's growth performance, I first explore the determinants of disaggregated exports to empirically test whether macroeconomic policy influences the size of the export sector in a given country. Second, I use IV-GMM, a simultaneous equations method, to identify the impact of macroeconomic policy and exports on economic growth. This serves not only to more accurately measure the marginal

effect of exports on growth, but also to determine the relative importance of various macroeconomic policy indicators. Indeed, there appears to be some evidence that macroeconomic policy may affect the level of exports. Furthermore, this relationship is stronger when using panel data as opposed to cross-section data, implying that the variation in macroeconomic policy over time within a country may matter more for exports and, additionally, that these effects tend to dissipate in the long run. When the two-step estimation is employed, the results show a positive relationship between manufacturing exports and growth, confirming conventional wisdom that countries that emphasize manufacturing exports experience higher economic growth, on average. However, there appears to be no statistical relationship between macroeconomic policy and economic growth, suggesting that policies influence growth, if at all, through their impact on other variables, such as disaggregated exports.

2 Manufacturing Exports and Growth: When is a Developing Country Ready to Transition from Primary Exports to Manufacturing Exports?

2.1 Introduction

Many developing countries are heavily dependent on primary products as their main source of export income.[1] However, several studies argue that countries that emphasize manufacturing exports will grow faster than those that emphasize exports of primary products (Hausmann, Hwang & Rodrik, 2007; Jarreau & Poncet, 2012; Crespo-Cuaresma & Wörz, 2005). The idea is that countries that export, particularly those that export products with a relatively high technological content, benefit from positive externalities that help their economies grow in ways that would otherwise not take place. The main sources of these positive externalities are likely to be knowledge spillovers and economies of scale. For example, a country may learn more efficient production techniques or benefit from increased specialization. Why, then, have more developing countries not grown their manufactured goods export sector? One possible explanation is that a country needs to be relatively developed before it can fully reap the benefits from increasing its manufactured exports. By its very nature, development is multifaceted and, thus, encompasses various aspects of an economy, such as income, education, investment, and trade. As in Azariadis & Drazen (1990), a critical mass of any combination of these variables may be necessary for a country to break out of an undesirable steady state. For example, a critical mass of skilled workers or a certain level of infrastructure may be necessary before a country is able to attract the business necessary to help it move from a point of relative stagnation to one of sustained growth. Many studies consider the possibility that a country needs a certain amount of income before it begins to see high rates of sustained growth, but

[1] Here, primary products generally refer to that class of goods which undergo minimal processing before being exported. Examples include oil, minerals, and agricultural products such as cocoa and coffee.

few explore other development thresholds.[2] An innovation of this paper is to examine the growth effects of disaggregated exports and allow for endogenously-determined thresholds based not only on income, but also on investment, education, primary exports, and manufacturing exports. Identifying thresholds in the relationship between exports and economic growth may have important policy ramifications for developing countries. Since the data determine the threshold variable and the location of the split(s), it may be possible for countries to better prioritize their development goals, so as to maximize long-run economic growth. Although numerous studies investigate the growth effects of export composition, none (to this author's knowledge) identifies thresholds in the relationship between disaggregated exports and economic growth. This paper aims to fill that gap.

The remainder of the paper is organized as follows. Section 2 discusses the relevant literature. Section 3 presents the methodology and examines the corresponding results. Section 4 concludes and discusses possible extensions and areas of future research.

2.2 Background

2.2.1 Exports and Economic Growth

A casual review of the relationship between exports and GDP would lead one to infer that the correlation between the two is positive (see Michaely (1977), Feder (1983), and Greenaway *et al.* (1999), among others). Intuitively, since exports are a component of GDP, increasing exports necessarily increases GDP, ceteris paribus. However, in addition, there are potential positive externalities created by exporting. A seminal study by Emery (1967) outlines three general ways these spillovers are realized: an increase in available foreign exchange, an increase in factor productivity,

[2]Durlauf & Johnson (1995), Papageorgiou (2002), Foster (2006), and Minier (1998, 2003) are notable exceptions. In addition to income, these authors also consider thresholds based on literacy rates, trade volume, export levels and export growth, democracy, and financial development, respectively.

and economies of scale. Grossman & Helpman (1991) claim that an emphasis on exports will lead to positive externalities for the non-export sector in the form of knowledge spillovers. Moreover, Edwards (1993) explains that these spillovers could take the form of more efficient management and better production techniques, for the export sector as well as the non-export sector. This, in turn, may lead to innovation and production expansion in each sector, consequently raising incomes and propelling economic growth. Exports also provide the foreign exchange needed to purchase imports, which provides further beneficial effects on economic growth (Thirlwall, 2000). Crespo-Cuaresma & Wörz (2005) argue that significant positive externalities accrue to the exporting country as a result of competition in international markets, including increasing returns to scale, learning spillovers, increased innovation, and other efficiency gains, all of which can increase the rate of economic growth.

Perhaps unsurprisingly, most empirical studies find a positive relationship between exports and economic growth.[3] Tyler (1981) utilizes a production function framework for a sample of 55 countries and generally corroborates earlier results that there exists a positive relationship between export growth and economic growth. In contrast, I include more countries and cover a longer time period. Additionally, I focus on the level of exports as opposed to export growth, following a simple model developed in the next section. Feder (1983) also employs a production function framework, but formally derives the externality effect of exports and finds that the export sector is more productive than the non-export sector. Furthermore, Feder shows this result is driven by positive production externalities that accrue to the export sector and, as such, countries that emphasize exports will grow faster than those that do not. As further evidence, Greenaway *et al.* (1999) use GMM on a panel of 69 countries over the period 1975-1993 and find that export growth propels economic growth. Recent work tends to focus more on specific case studies, such as Rangasamy (2009), which uses

[3]See Edwards (1993) and Crespo-Cuaresma & Wörz (2005) for a more thorough review of this literature.

quarterly data from 1960-2007 for South Africa and finds evidence of uni-directional Granger causality running from exports to GDP.

2.2.2 Disaggregated Exports and Economic Growth

Although many studies find a positive relationship between total exports and economic growth, it is reasonable to question whether this relationship holds for both primary exports and manufacturing exports. The main argument for a differing impact, according to Fosu (1996), is that primary exports are usually raw and unprocessed whereas manufactured goods are more technologically intensive, and therefore more likely to create positive spillovers. Thus, I expect manufacturing exports to be more positively correlated with economic growth than primary exports.

However, empirical evidence on the relationship between disaggregated exports and economic growth is somewhat mixed. Xu (2000) describes primary exports as creating a "vent for surplus" in which resources that were previously unused (or perhaps underused) are employed to increase production of primary products, which are then exported. Consider, for example, a country that produces and sells corn domestically. The country can only consume so much corn on its own, so that exporting allows previously unused/underused land and labor to be utilized. In so doing, primary exports exert positive externalities on the non-export economy through an increase in demand for services and resources, which leads to increased economic growth for the economy as a whole. Indeed, Xu (2000) finds empirical support for the hypothesis that primary exports positively affect economic growth. Xu uses a VAR approach for a sample of 74 countries over the period 1965-1992 and finds that 55 of the 74 countries demonstrate positive effects of primary export growth on long-term GDP growth.

In contrast, Syron & Walsh (1968) use data on 50 countries over the period 1953-1963, then divide their sample into countries with low, medium, and high food content

in exports. They find that increasing exports may be beneficial for all countries, as long as the less developed countries are not dependent on exporting food, which is a common form of primary good. The Prebisch-Singer hypothesis (Prebisch, 1950; Singer, 1950) states that the relative price of primary products, as compared to manufactured goods, deteriorates over time. Singer (1950) explains that technological progress will benefit either producers in the form of profits or consumers in the form of lower prices. In the case of primary products, more technological progress usually means that less raw materials and labor will be utilized per unit of output. In turn, prices for these products fall, which leads to layoffs and lower wages for workers in the exporting country. Since workers are making less money, they must spend less and save less, which impedes economic growth. The problem perpetuates in the following manner:

> Good prices for their primary commodities, specially if coupled with a rise in quantities sold, as they are in a boom, give to the underdeveloped countries the necessary means for importing capital goods and financing their own industrial development; yet at the same time they take away the incentive to do so, and investment, both foreign and domestic, is directed into an expansion of primary commodity production, thus leaving no room for the domestic investment which is the required complement of any import of capital goods.[4]

This issue is particularly pronounced in developing countries, in which a large share of total exports are derived from primary products. The unc (2005) states that 75% of exports from Africa are primary products and 39 of 48 African developing countries have a range of primary products as their main source of exports (defined as 50% or more of total exports). Furthermore, 14 out of 20 Latin American developing countries also have primary products as their main source of exports. An exception is East and South Asia, where only 3 of 19 developing countries rely on primary products as their main export source. The mixed empirical results on the relationship between

[4]Singer (1950), pg. 482. This turns out to be an early explanation of Dutch Disease.

primary exports and economic growth lead to an ambiguous expectation about the sign of the coefficient estimate.

Developing a strong manufacturing export sector is often thought to be vital for any developing country. Bigsten *et al.* (2004) explain that the domestic market for manufactured goods is typically small in developing countries. Since these economies are characterized by low incomes per capita, they must focus on international markets if they plan to grow their manufacturing sector. Greenaway *et al.* (1999) use data on 66 countries over the period 1980-1990 and find that countries that export manufacturing goods benefit more from export expansion than countries that focus on exporting primary products. Crespo-Cuaresma & Wörz (2005) use a panel of 45 countries over the period 1981-1997 and find that exporting goods with high technology content is more beneficial for growth than exporting goods with low technology content. Based on this evidence, they conclude that countries should promote high-technology industries over low-technology and agricultural industries. Hausmann *et al.* (2007) also find that exporting goods with higher levels of productivity, such as manufactured goods, leads to higher rates of economic growth.

2.2.3 Exports, Thresholds, and Economic Growth

While most studies show that increasing exports is positively related to economic growth, there is less consensus over the exact nature of this relationship. For example, the aforementioned study by Michaely (1977) divides a sample of 41 developing countries into least developed and most developed countries over the period 1950-1973 and finds a positive relationship between export growth and economic growth for the most developed countries, but not for those which are least developed. Michaely argues this is evidence that countries need to reach a threshold level of development before they can fully reap the benefits from increasing exports. However, Michaely's study is limited in that it arbitrarily defines development and the corresponding

threshold. In contrast, I let the data endogenously determine the appropriate measure(s) of development and the proper threshold(s). Tyler (1981) extends Michaely's study by modifying the measure of export growth and covering 55 countries over the time period 1960-1977, finding a positive relationship between export growth and economic growth. However, the study omits the poorest countries from the sample, claiming "...some basic level of development is necessary for a country to most benefit from export oriented growth, particularly involving manufactured exports," although Tyler does not test this claim directly.[5] Other studies find evidence of diminishing marginal returns to increasing exports. For example, Kohli & Singh (1989) analyze a sample of 41 developing countries over two time periods, 1960-1970 and 1970-1981, in which exports are more important for economic growth in the earlier sample than the latter. Average economic growth rates are similar in each period, as are export shares, yet the export variables of interest are insignificant in the later period. As such, they infer that the returns to exporting diminish over time. More recent work by Foster (2006) also finds diminishing returns to export growth, but finds no evidence that a country needs to be relatively developed before it can benefit from increasing its exports. An advantage of Foster's approach is that he allows for the data to endogenously split the sample, using the technique of Hansen (2000).[6] However, Foster (2006) only analyzes aggregate exports in a sample of African countries. In contrast, my study includes a wider variety of countries and considers the impact of disaggregated exports in addition to total exports.

The extant literature clearly shows that exports play an important role in the economic growth process of a country. However, many empirical studies only consider the growth of total exports. The few studies that investigate disaggregated exports do not consider, to my knowledge, that a country may need to meet some sort of development

[5]Tyler (1981), p. 124.

[6]A disadvantage of the Hansen method is that it only allows for one threshold for each threshold variable. The regression tree technique discussed later imposes no such restrictions.

threshold before it can benefit from exporting manufactured goods. Furthermore, it's possible that the level of exports is more relevant than export growth for capturing the positive externality effects. I explore this possibility in the next section.

2.3 Methodology

In modeling economic growth, I begin by following the contributions of Solow (1956) and Mankiw, Romer & Weil (1992) and assume the following Cobb-Douglas production function:

$$Y_{i,t} = A_{i,t} K_{i,t}^{\alpha} H_{i,t}^{\beta} L_{i,t}^{\gamma} \tag{1}$$

for country i during period t, in which Y is total output, K is physical capital, H is human capital, and L is labor. In neoclassical growth models such as Solow (1956), A grows at an exogenous rate, which is usually referred to as technological progress. However, Azariadis & Drazen (1990), among others, argue that this technological progress may depend on myriad social inputs that are realized at the aggregate level, rather than only at the individual firm level. Tyler (1981) hypothesizes that part of the technological progress or social input captured by the growth of A is the result of positive spillovers from the export sector. A_{it} is defined as in Mankiw *et al.* (1992), among others:

$$A_{i,t} = A_0 e^{g_{i,t}} \tag{2}$$

in which A_0 is the initial level of technology in a country that grows at rate g. I assume technological progress, g, depends in part on the level of exports in a country, so that:

$$g_{i,t} = \eta + \theta X_{i,t} \tag{3}$$

Generally, the only factors considered to be direct inputs into the production process are physical capital, human capital, and labor. However, Tyler (1981), Feder (1983), and Fosu (1990), among others, argue that although exports are not direct

inputs into the production process they contribute to total output through positive spillover effects from the export sector to aggregate production. Therefore, I hypothesize that exporting countries have higher levels of economic growth than they would under autarky and this effect is due to more than just selling to a larger market. As mentioned previously, these spillovers may be realized through the economies of scale that result from international competition, including improved resource allocation, increased specialization, higher worker productivity, and better management practices. Inefficiencies may also be reduced in the non-export sector due to competition from the export sector.

To explore the relationship between disaggregated exports and economic growth empirically, as well as possible nonlinearities in that relationship, I first consider both panel data and cross-sectional data. Using Equations (2) and (3), and after a log transformation of Equation (1), I obtain the following equation for the panel data analysis, which can be estimated using the fixed effects methodology[7]:

$$y_{i,t} - y_{i,0} = \eta + \psi y_{i,0} + \theta x_{i,t-1} + \alpha k_{i,t} + \beta h_{i,t} + \gamma l_{i,t} + \epsilon_{i,t} \tag{4}$$

in which lowercase values indicate the variables are in logs and $\epsilon_{i,t} = \delta_i + \omega_t + u_{i,t}$. The dependent variable is GDP per capita growth during period t. Country-fixed effects and time effects are captured by δ_i and ω_t, respectively. Data are averaged over 5-year time intervals for the period 1960-2009. As such, $y_{i,0}$ is GDP per capita at the beginning of each period t. This measure of initial GDP per capita is commonly included to control for the convergence effect, whereby it is often observed that poor countries grow faster than rich countries.[8] Data on GDP are from the Penn World Tables mark 7.0 (Heston, Summers & Aten, 2011). Human capital, h, is measured as

[7] A Hausman test yields $\chi^2 = 104.11$, soundly rejecting the null hypothesis, implying fixed effects are preferred to random effects.

[8] See Solow (1956), Mankiw *et al.* (1992), and Barro (1991), among others, for a more detailed exposition.

the percentage of secondary schooling attained by the population aged 15 years and older, as taken from Barro & Lee (2010).[9] Remaining data are from the World Bank's World Development Indicators 2010 database. The capital stock, k, is measured as the investment to GDP ratio, and l is measured as the average annual population growth rate. The export variables of interest, x, are lagged one period to allow time for spillovers to take effect and reduce endogeneity concerns. These variables are measured as the ratio of total exports to GDP, the ratio of manufacturing exports to GDP, and the ratio of primary exports to GDP. As such, Equation (4) is estimated twice, once with total exports and once with exports disaggregated into its manufacturing and primary components.

Table 2.1: Panel Results

	(1)	(2)	(3)	(4)
	Full	Full	GDP$\leq$ \$5,381	GDP$>$ \$5,381
INIT_GDP	-0.196***	-0.206***	-0.205***	-0.292***
	(0.025)	(0.023)	(0.042)	(0.044)
EDUC	-0.039*	-0.035	-0.029	0.006
	(0.020)	(0.022)	(0.046)	(0.018)
INV	0.159***	0.124***	0.147***	0.073**
	(0.023)	(0.023)	(0.032)	(0.029)
POPGR	0.001	-0.022	0.009	-0.010
	(0.062)	(0.063)	(0.125)	(0.062)
TOTEXP_{lag}	0.002			
	(0.016)			
MNFG_{lag}		0.026***	0.038***	0.001
		(0.008)	(0.012)	(0.014)
PRIM_{lag}		-0.000	-0.013	0.025
		(0.013)	(0.018)	(0.023)
Constant	1.307***	1.526***	1.221***	2.502***
	(0.265)	(0.228)	(0.375)	(0.411)
R^2	0.292	0.284	0.267	0.370
Observations	882	756	378	378
No. of countries	117	115	71	61

Note: Time dummies are omitted for space considerations. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

[9]These schooling data are not a perfect measure of human capital, as this does not account for cross-country differences in quality of schooling (Wood & Mayer, 2001).

I begin by using a panel of 117 countries over the period 1960-2009.[10] Many earlier studies make use of cross-sectional data; however, panel data allows for variation over time within countries, rather than strictly looking at variation between countries, which may potentially yield more accurate results. Column (1) of Table 2.1 shows that the coefficient estimate on total exports has the expected sign but is statistically indistinguishable from zero, suggesting that exports may not be beneficial for growth. This result is surprisingly inconsistent with earlier studies, such as Michaely (1977). However, there are several potential explanations for this. First, I use a much larger sample of countries, which include developing and developed countries, for a longer time period. Second, Michaely (1977) and other early studies look at bivariate relationships, whereas the current study controls for many other factors. Finally, the measurement of the variables is different, in that many earlier studies focus on export growth whereas the current study is concerned with the level of exports, as discussed previously. It is possible that the relationship between exports and growth is masked by aggregation. To address this, I disaggregate total exports into manufacturing and primary exports in column (2). As expected, the coefficient estimate on manufacturing exports is positive and statistically significant. Furthermore, the magnitude of the coefficient suggests that a country that increases its share of manufacturing exports in GDP by ten percentage points would see a corresponding increase in economic growth in the following period by nearly 0.3 percentage points.[11] Although primary exports do not enter significantly, they are of the correct anticipated sign.

Since the purpose of this paper is to investigate the existence of development thresholds, I consider this possibility in columns (3) and (4) of Table 2.1. A common test for nonlinearity in the literature is to split the sample based on the median level of development, for which income is typically used as a proxy. As such, I split the

[10] OPEC countries are omitted from all samples; the results are robust to their inclusion. These results are available from the author upon request.

[11] A one standard deviation (3.45 percentage point) increase in (lagged) manufacturing exports results in a 0.09 percentage point increase in growth.

sample based on the median of $\$5,381$ per capita, which is approximately the size of South Africa in 1995.[12] For countries below the median level of initial GDP per capita, manufacturing exports appear to be highly beneficial for economic growth. Specifically, countries which are in the low-income subsample seem to benefit significantly from emphasizing manufacturing exports, whereas primary exports have no discernible impact on their growth process. In this case, the magnitude is approximately 50% greater than in the full sample case in column (2). As countries become wealthier, manufacturing exports appear to matter less, suggesting the existence of diminishing marginal returns to exporting manufactures. Overall, these results are consistent with previous findings that manufacturing exports are more beneficial for growth than primary exports and also lend some support to Kohli & Singh (1989), who find diminishing returns to exports. These results, however, are not indicative of a development threshold requirement before the beneficial effects from exporting manufactured goods are realized. On the contrary, it appears that a country may benefit more by emphasizing manufacturing exports during earlier stages of the growth process.

While using a panel is informative, it may be the case that it takes much longer for the spillovers from exporting to have a discernible influence on growth than is allowed for in the panel context. To consider the long-run relationship, I use data for 92 countries over the period 1970-2009 and estimate the following equation:[13]

$$y_{i,2009} - y_{i,1970} = \eta + \psi y_{i,70} + \alpha k_{i,7079} + \beta h_{i,70} + \gamma l_{i,7079} + \theta x_{i,7079} + \epsilon_i \qquad (5)$$

for country i, in which the dependent variable is the total growth of GDP per capita

[12] A partial F-test fails to reject the null hypothesis that the two equations are the same (F-statistic = 1.33 p-value= 0.196).

[13] The number of countries varies between the panel and cross-section estimates because several countries do not report export data until after 1980. Thus, these countries appear in the panel, but not the cross-section.

over the period 1970-2009 and y_0 is initial GDP per capita.[14] The remaining variables are defined analogously as above. However, the initial value (1970) of human capital, h, is used. Furthermore, ten-year averages over the period 1970-1979 are used for physical capital (k), labor (l), and exports (x).

Equation (5) is estimated twice, once with the total exports/GDP ratio and again using the manufacturing exports/GDP ratio and the primary exports/GDP ratio. The estimates in columns (1) and (2) of Table 2.2 assume there is a linear relationship between GDP per capita growth and the explanatory variables. The results again indicate there is no statistically significant relationship between total exports and GDP per capita growth. I again disaggregate exports into its manufacturing and primary components in column (2). First, notice that the coefficient estimate on education becomes highly significant and positive when compared to the results from Table 2.1, suggesting that the returns to education may take time before the gains are fully realized. The same story holds for investment; the gains, whether direct or indirect, take time to materialize. The coefficient estimate on manufacturing exports remains positive and highly significant. As such, the long-term impact appears to be larger than the short-term impact.

I split the sample in columns (3) and (4) of Table 2.2, again based on the median level of initial GDP per capita.[15] The results are similar to the fixed effects results, in which manufacturing exports are more important for low-income countries than high-income countries, and are more closely related to growth than primary exports.[16] Furthermore, the direction of change in coefficient estimates between Columns (3) and (4) in Tables 2.1 and 2.2 are similar.

Thus far it appears that, at a minimum, manufacturing exports are more posi-

[14]The year 1970 is chosen as the starting point instead of 1960 so as to maximize the sample size.
[15]Since all values for initial GDP per capita are from 1970, it is no surprise that the median value is lower in this case than in the earlier panel case.
[16]However, a partial F-test could not be rejected in this case; F-statistic = 1.17; $Prob > F = 0.333$.

Table 2.2: Cross-section Results

	(1)	(2)	(3)	(4)
	Full	Full	GDP$\leq$ \$3,041	GDP$>$ \$3,041
$INIT\_GDP_{70}$	-0.229**	-0.295***	-0.005	-0.454**
	(0.097)	(0.082)	(0.232)	(0.153)
$EDUC_{70}$	0.246***	0.279***	0.210*	0.256**
	(0.083)	(0.071)	(0.109)	(0.117)
INV_{7079}	0.658***	0.336*	-0.024	0.821**
	(0.219)	(0.179)	(0.266)	(0.329)
$POPGR_{7079}$	-0.428*	-0.399*	-0.753*	-0.324
	(0.249)	(0.220)	(0.420)	(0.306)
TOT_EXP_{7079}	-0.047			
	(0.079)			
$MNFG_{7079}$		0.108**	0.189*	0.066
		(0.048)	(0.098)	(0.056)
$PRIM_{7079}$		-0.034	-0.015	-0.068
		(0.053)	(0.079)	(0.070)
Constant	-0.497	1.920**	1.537	1.928*
	(0.833)	(0.757)	(1.428)	(1.133)
R^2	0.306	0.380	0.446	0.354
No. of Countries	92	86	43	43

Note: Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

tively correlated with growth than primary exports, which produces an interesting question: If an emphasis on manufacturing exports yields better growth prospects, then why do so many developing countries still rely heavily on exporting primary products? A reasonable answer is that a country must be relatively developed before it can benefit from exporting manufactured goods and, furthermore, the appropriate development metric may not be income. Thus, the production function for a country may vary between different regimes, implying that performing OLS on the full sample of countries may produce inaccurate results. In particular, it may be incorrect to assume a linear relationship between manufacturing exports and GDP per capita growth because the true relationship may, indeed, be nonlinear. I explored one way to test this hypothesis in the preceding section. While these results may appear to be evidence against the hypothesis that a country needs to be relatively developed before it can benefit from increasing manufacturing exports, keep in mind that the

level of development and thresholds used thus far are arbitrary, which can lead to inaccurate results. To allow the production function to differ between regimes while avoiding an arbitrary sample split, I employ regression tree analysis in the following section, an endogenous sample-splitting technique whereby the data determine the threshold variable and value of the best sample split(s).

2.3.1 Regression Tree Analysis

I employ regression tree analysis, following the contributions of Breiman, Friedman, Olshen & Stone (1984) and Härdle (1990).[17] The idea is that the positive relationship between manufacturing exports and growth may depend on some threshold measure of development, above and below which the production function for countries varies. To determine the appropriate threshold variable and value, the data are indexed by each potential threshold variable and all possible two-way sample splits are considered. It is possible that no splits of the data will occur, in which the full sample is endogenously selected as the best specification. There is no limit to the number of threshold variables that may be considered, and testing additional variables does not affect the procedure in any way (other than computational time). Regressions are run on the subsamples of each possible split and the one which minimizes the sum of squared residuals is chosen as the first split. The process is then repeated to identify additional splits, with each potential threshold variable being considered each time. To avoid unnecessary splits (i.e. over-parameterization), a cost function is introduced that penalizes splits which result in extremely small decreases in the error variance, also known as "pruning the tree." A common form of this cost function is as follows:

$$\Psi = SSR + \kappa(\#(N) - 1) \tag{6}$$

[17] Early applications of this technique in economics include Durlauf & Johnson (1995) and Minier (1998), among others.

where SSR is the sum of squared residuals and $\#(N)$ is the number of terminal nodes, which cannot be split any further. Enlarging the value of κ increases the cost of splitting the sample, where $\kappa = 0$ represents all possible sample splits and $\kappa = \infty$ is equivalent to the full sample with no splits. The "leave-one-out" method of cross-validation is then used on the pruned trees to select the final appropriate specification, which is the one that minimizes the cross-validated SSR.[18]

2.3.2 Threshold Variables

Before proceeding with the threshold analysis, some discussion is in order on the potential threshold variables: initial GDP per capita, physical capital investment, human capital investment, primary exports and manufacturing exports. First, within the threshold literature, initial GDP per capita is commonly considered as a potential threshold variable and as a proxy for the level of development of a country, not least because these data are plentiful and readily available.[19] In fact, Tyler (1981) uses a sample that omits the poorest countries because of the perceived need for a minimum level of income before the beneficial effects of exports can be realized.

Two additional variables I consider are physical capital investment and human capital investment. Intuitively, some minimal level of physical infrastructure is likely needed before a country can adequately address export demand and, thus, before expanding the manufacturing exports sector is beneficial. While it is true that infrastructure is also required for the export of primary goods, there is also more of a domestic market for primary goods relative to manufactured goods in developing countries. Moreover, manufactured goods are commonly more capital-intensive than primary goods (Hausmann *et al.*, 2007). I include the percentage of secondary school-

[18] In the "leave-one-out" method of cross-validation, the ith observation is omitted and the SSR is calculated over the remaining observations in the subsample. This is repeated for each i and the resulting residuals are summed over each subsample. The tree which produces the smallest cross-validated SSR converges in mean-squared error to the best nonlinear predictor (Breiman, Friedman, Olshen & Stone, 1984).

[19] See Durlauf & Johnson (1995) and Minier (2003), among others.

ing attained by the population as a proxy for a country's human capital. In many studies, such as Calderón, Chong & Zanforlin (2001), a skilled labor force is necessary to produce manufacturing goods, which have a relatively high technological content. Therefore, a critical mass of skilled workers may be necessary before a beneficial effect of manufacturing exports on economic growth is observed.

Finally, the ratio of primary exports/GDP and manufacturing exports/GDP are each considered as potential threshold variables, as a critical mass of either of these variables may be necessary before a beneficial impact from manufacturing exports is realized. Xu (2000) suggests that building up to a certain level of primary exports supplies the foreign exchange needed to purchase imports, particularly the advanced technology and capital needed to enhance the productivity of the manufacturing sector. Achieving a particular level of manufacturing exports may be necessary before the efficiencies of economies of scale are realized, thus making it necessary to reach a threshold level of manufacturing exports before a positive spillover to aggregate production takes place.

Table 2.3: Threshold Variable Correlation Matrix

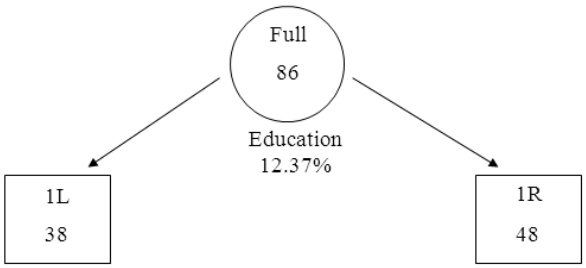
	GDP_{70}	$EDUC_{70}$	INV_{7079}	$MNFG_{7079}$	$PRIM_{7079}$
GDP_{70}	1.000				
$EDUC_{70}$	0.747	1.000			
INV_{7079}	0.610	0.504	1.000		
$MNFG_{7079}$	0.625	0.496	0.562	1.000	
$PRIM_{7079}$	-0.304	-0.116	-0.079	-0.182	1.000

The correlation matrix in Table 2.3 below shows the relationship between the potential threshold variables. Perhaps unsurprisingly, education, investment, and the level of manufacturing exports are all positively related to income. This is important because even though the variables are correlated, the regression tree procedure chooses the variable most appropriate to split the sample (if a split is necessary).

2.3.3 Regression Tree Results

In proceeding with the regression tree procedure, the first sample split chosen by the data is based on the initial percentage of the population that has attained some secondary education, implying that the average production function for countries below this threshold is statistically different from the average production function of countries above the threshold. Moreover, this human capital measure is chosen over splits based on any of the of other potential threshold variables, including income. Although the low-education subsample is also characterized by low income (relative to the high-education subsample), the regression tree procedure still determined the education split was preferred to a split based on income. The split occurs at 12.37%

Figure 2.1: Pruned Regression Tree



Notes: Square nodes denote terminal nodes; the number inside each is the number of observations/countries in that node. Underneath the non-terminal (circular) node is the level of the variable chosen for that split; nodes to the left contain observations that are less than or equal to the given value.

(of the population that has achieved some secondary education), approximately the level of Spain in 1970, with 48 countries above this level and 38 countries below it.[20] This split occurs approximately at the full-sample mean ratio of the population that has attained some secondary education of 12.42% (see Table A.5 in the Appendix) but below the median of 16.88%. The regression tree technique splits the sample further, but these additional splits were deemed insignificant by the cross-validation proce-

[20] As a robustness check, education data from Cohen & Soto (2007) are also used; the correlation between datasets is 0.88. The regression tree results are qualitatively consistent.

dure. The procedure also chooses this split over the full sample, implying that a linear specification for the full sample is inappropriate. Figure 2.1 shows the final pruned tree.[21] Each terminal node contains a sample of countries that behave similarly according to the regression tree technique. Thus, the typical problem of heterogeneity is mitigated by the regression tree technique, albeit not completely resolved. The following results should be interpreted with caution, as asymptotic theory to test the significance of the splits does not yet exist.

Table 2.4: Regression Tree Results (Pruned Tree)

Node:	Full	1L	1R
		EDUC$\leq$ 12.37%	EDUC$>$ 12.37%
$INIT\_GDP_{70}$	-0.295	-0.299	-0.332
	(0.082)	(0.126)	(0.098)
$EDUC_{70}$	0.279	0.504	0.179
	(0.071)	(0.135)	(0.106)
INV_{7079}	0.336	0.326	0.481
	(0.189)	(0.257)	(0.267)
$POPGR_{7079}$	-0.399	-1.726	-0.175
	(0.220)	(0.610)	(0.202)
$MNFG_{7079}$	0.108	-0.153	0.181
	(0.048)	(0.083)	(0.047)
$PRIM_{7079}$	-0.034	-0.086	0.032
	(0.053)	(0.079)	(0.062)
Constant	1.920	4.171	1.562
	(0.757)	(1.619)	(0.926)
R^2	0.380	0.433	0.455
No. of Countries	86	38	48

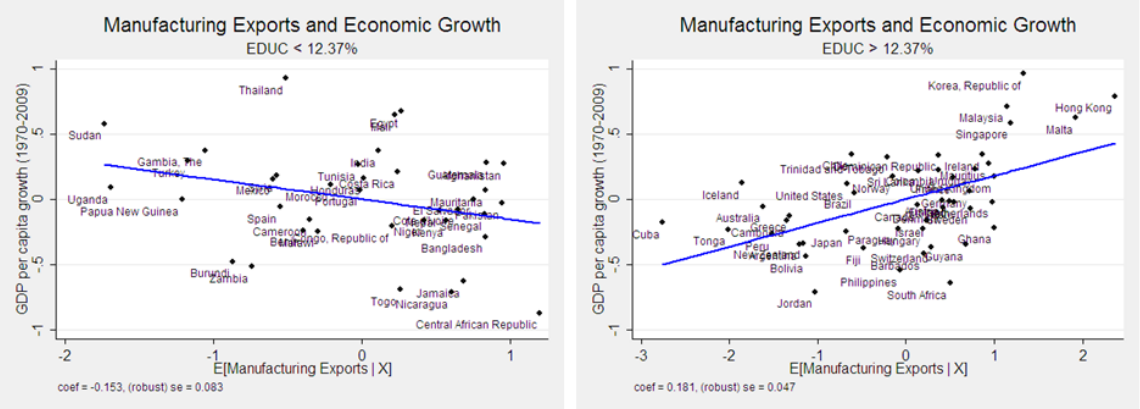
Note: Robust standard errors are in parentheses.

The regression results from each terminal node are in Table 2.4 and there are several interesting points to observe. First, manufacturing exports are negatively related to GDP per capita growth in the low-education subsample (node 1L) and positively related to growth in the high-education subsample (node 1R). This relationship is also clearly demonstrated in Figure 2.2. Moreover, the difference between the two coefficients is substantial. This supports the hypothesis that a minimum level of

[21] See Figure A.1 in the Appendix for the full tree before pruning.

skilled workers is necessary before the beneficial effects of manufacturing exports are realized.

Figure 2.2: Manufacturing Exports and GDP Per Capita Growth



Second, the coefficient on education decreases by nearly 65% from the low-education subsample to the high-education subsample, suggesting that there are diminishing returns to increased education. To ensure the results are not driven by the highly-educated "Asian tiger" countries, who also have large manufacturing exports/GDP ratios, I omit them from the sample; the results remain virtually unchanged.[22] Third, the coefficient on investment is higher in the high-education subsample, suggesting that more educated countries invest more efficiently. Consider a country that builds a new factory with the hopes of enticing new investors, yet is unable to do so because it does not possess the necessary skilled workforce to complement the factory investment.

Overall, the average proportion of the population with some secondary education in the low-education subsample is approximately 4.5% compared to 27.5% in the high-education subsample (see Table A.5). Moreover, the average growth rate in the high-education subsample is nearly double that of the low-education subsample (85.5% to 43.2%). The high-education subsample is also characterized by a higher average

[22]These results are available from the author upon request.

investment/GDP ratio, a higher average share of manufacturing exports/GDP ratio, lower average population growth, and a lower average share of primary exports/GDP ratio. Although largely consistent with the existing literature, the results also suggest that achieving a basic level of education and skilled workers is vital for countries to benefit from expanding their manufacturing exports sector and achieve sustained long-run growth. Furthermore, this development threshold is deemed more appropriate than thresholds based on the other measures of development that are tested.

2.3.4 Sensitivity Analysis

The aforementioned caveat about the lack of asymptotic theory in regression tree analysis may raise questions about the true impact of the explanatory variables in each regime (i.e. low-education and high-education). Since the regression tree procedure identifies "education" as the best variable upon which to split the sample, it is informative to interact education with all other variables in the original regression to ascertain a more accurate estimate of the magnitude of each coefficient. In doing so, I can evaluate the marginal effect of the explanatory variables at various levels of education. This serves several purposes. First, it helps to assess the qualitative consistency of the regression tree results. Second, it allows for a discussion of the statistical significance of the corresponding results. Finally, it informs the discussion on which variables may be driving the results.

The qualitative interpretation from the regression tree results is largely in agreement with the results in Table 2.5 below, with the exception of the education variable. The evidence of diminishing returns to education seems to disappear when the explanatory variables are directly conditioned on education. However, the case for the other results is strengthened. For example, the coefficient estimate on investment is only statistically significant at higher levels of education, suggesting that countries with more education tend to invest more efficiently than their low-education coun-

terparts. A similar story is true of manufacturing exports, as the coefficient estimate is statistically indistinguishable from zero at extremely low levels of education but is positive and highly statistically significant at high levels of education. This provides further evidence in favor of the hypothesis that a country needs a minimum level of skilled workers before the benefits of manufacturing exports on economic growth are realized.

Table 2.5: Marginal Effects of Interacting Education with all other variables

Percentile of Education:	10^{th}	25^{th}	50^{th}	75^{th}	90^{th}
Marginal Effect of:					
$INIT\_GDP_{70}$	-0.090	-0.192*	-0.307***	-0.370***	-0.412***
	(0.163)	(0.108)	(0.076)	(0.087)	(0.104)
$EDUC_{70}$	0.332*	0.347***	0.364***	0.373**	0.379**
	(0.186)	(0.101)	(0.095)	(0.142)	(0.180)
INV_{7079}	0.129	0.304	0.501**	0.611***	0.683**
	(0.260)	(0.187)	(0.204)	(0.254)	(0.296)
$POPGR_{7079}$	-1.625***	-1.050***	-0.403*	-0.044	0.195
	(0.587)	(0.377)	(0.228)	(0.255)	(0.314)
$MNFG_{7079}$	-0.087	0.002	0.102**	0.157***	0.194***
	(0.088)	(0.058)	(0.039)	(0.043)	(0.051)
$PRIM_{7079}$	-0.097	-0.062	-0.022	>-0.0005	0.014
	(0.119)	(0.077)	(0.049)	(0.055)	(0.068)

Note: The coefficient point estimates of the explanatory variables (including the interaction terms) and constant term are omitted for space considerations and brevity, but are available from the author upon request. Robust standard errors are in parentheses. Asterisks denote significance at the following levels: *** p<0.01, ** p<0.05, * p<0.1

2.4 Concluding Remarks

Past studies exploring the relationship between exports and economic growth have been limited by arbitrary definitions of development, including the point at which a country is considered "developed." In this paper, I use an endogenous sample-splitting technique to allow the data to determine not only the threshold level of development that separates countries into different regimes, but also determines which measures

of development are most important. Using the regression tree technique, I find the best way to split the sample is based on educational attainment. Countries with the lowest levels of human capital do not appear to benefit from exporting; in particular, the correlation between manufacturing exports and economic growth is negative and relatively large. However, once a country develops a critical level of skilled workers, the return to exporting manufactured goods greatly increases, as does the return on physical capital investment.

So, when is a developing country ready to transition from a reliance on primary exports to manufacturing exports? The evidence in this study suggests the answer is once the populace attains a certain level of education. While the lack of asymptotic theory invites caution when making inferences based on the results, there are still several policy implications that may be gleaned from this study. First, investing heavily in the manufacturing sector in a country without the necessary skilled workers is likely to be an inefficient use of resources. Second, when exporting, manufacturing exports are more highly correlated with growth than primary exports, conditional on a country having attained a threshold level of human capital. Third, it appears that education yields the highest return where it has the lowest initial value, although this particular result is not robust.

Crespo-Cuaresma & Wörz (2005) show that higher value-added manufacturing exports are better for growth. Future research should focus on further disaggregating exports as more detailed data become available. Exports of services, for example, are not included in this study due to limited data availability. Initial evidence from Peneder (2003) suggests that the export of services may not be conducive to the long-run growth prospects of a country. However, this relationship needs to be explored further as more data become available. While beyond the scope of the current study, another useful exercise may be to consider the relationship between disaggregated exports, trading partners, and economic growth. That is, does a country's trading

partner(s) matter for economic growth within the current context? Addressing this question may better equip countries to select trading partners and formulate related policies.

3 The Effect of Fiscal Episodes on the Extensive and Intensive Margins of Exports

3.1 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 of the existing literature examines the impact on economic growth of changes in tax rates versus changes in government spending, as in Alesina & Ardagna (2009). Differentiating between the various sources of fiscal stimuli or consolidation is outside the scope of the current paper. Instead, we use the fiscal episodes identified by Alesina & Ardagna (2009) and focus on how these episodes affect the margins of trade. Utilizing bilateral export data for 20 OECD countries, we examine the effect of a fiscal stimulus and/or consolidation on the extensive and intensive margins of exports. The extensive margin is defined as the total number of products country h exports to country i and the intensive margin is the average volume per product of the exports from h to i. In general, we find that a fiscal stimulus in an exporting country is associated with a substantial decrease in the extensive margin, ranging between 10% and 13.6%, which results in a decrease in total exports of between 21.3% and 27.3%. However, a fiscal consolidation in an exporting country is associated with an increase in the extensive margin of approximately 16% and a decrease in the intensive margin of nearly 8%, leading to a net increase in total exports. Overall, it appears that fiscal episodes have a significant influence on exports and trade margins, particularly when the episode occurs in the exporting country.

The paper proceeds as follows. Section 2 explores the existing literature on the extensive and intensive margins of exports, and also considers the relevant literature on fiscal episodes. Section 3 presents the methodology, data, and results. Section 4 concludes.

3.2 Background

The recent focus of the trade literature is on highly disaggregated, firm-level analysis of the extensive and intensive margins of exports (Bernard, Jensen, Redding & Schott, 2007). Most of these studies seek to address which margin contributes the most to overall export growth and the results are somewhat mixed. This is primarily due to the different definitions of each margin, which vary depending on the level of data aggregation and scope of the study. Since the current paper is concerned with outcomes along each margin after a fiscal episode, we choose to focus on country-level data, as changes in fiscal policy are more likely to materialize in country aggregates than firm-level data. However, an understanding of the issues involved in measuring each margin and how they contribute to export growth is generalizable to the country-level, so that a review of the existing literature on the extensive and intensive margins of exports is illustrative; this follows in the next section.

3.2.1 Empirical support for the the extensive margin

A recent study by Hummels & Klenow (2005) seeks to address the issue of how large economies are able to export so much more than smaller economies. Specifically, the authors examine the importance of the extensive and intensive margins of exports relative to export growth, in which they compare their results to those from more traditional trade models, particularly the seminal contributions of Armington (1969) and Krugman (1981). Hummels & Klenow (2005) use export data from 1995 for 126 countries, to 59 importers, across 5,017 six-digit product categories, for which they decompose exports into the extensive and intensive margins. The extensive margin is defined 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, say h, relative to the nominal exports from the rest of the world in the categories that h also exports. Thus, the extensive margin is

essentially a measure of diversification and the intensive margin is a measure of trade volume, which is similar to the current study. OLS is employed on a simple bivariate model that considers the relationship between each margin and the ratio of GDP in the exporting country relative to world GDP.[23] In general, the results suggest the extensive margin is the most important component of exports, accounting for 62% of the larger volume of exports from large economies. Additionally, the authors find that wealthier countries export more goods at modestly higher prices, implying that they are exporting higher-quality products. This evidence is contrary to the Armington (1969) model, which does not allow for an extensive margin or quality differences, and to the Krugman (1981) model, which allows for an extensive margin but does not account for the fact that firms may not export at all, or may only export to a small subset of markets. Thus, Hummels & Klenow (2005) stress the need for a model that incorporates both an extensive and intensive margin, but one that also takes into account product differentiation and export-market entry costs. We are able to address this, in part, with the use of a gravity model for estimation and SITC four-digit level data.

Kehoe & Ruhl (2009) analyze changes in the extensive margin as a result of trade liberalization, structural changes, and cyclical changes. Previous studies defining the extensive margin have typically focused on the switch from zero, or extremely small, trade flows to positive trade flows. To define the cutoff of what are considered small trade flows, past studies have imposed a country-invariant threshold value of trade (e.g. $\$50,000$). The Kehoe & Ruhl (2009) study is unique in that the threshold which divides products into least-traded and most-traded is specific to each country, defined as products which cumulatively make up only one-tenth of total export value. Thus, changes in the extensive margin show up as changes in the total trade share

[23]The authors also consider a trivariate framework, where the explanatory variables are GDP per worker and overall employment. The results are similar, so the bivariate results are emphasized here for parsimony.

of the least-traded products over time. The data cover several country pairs over an 11-year time period encompassing the year of one of the aforementioned events (i.e. trade liberalization, structural change, or cyclical change) with 5 years of data before and after each event. Products are defined by the SITC (revision 2) four-digit code. The results show significant evidence of extensive margin growth after a trade liberalization or structural change, but no significant growth as a result of changes in the business cycle. When considering NAFTA as an example of a trade liberalization, the data show an increase in the extensive margin between Mexico and Canada, for which the 10% of least traded goods in 1989 constitute 31% of exports by 1999.[24] The study shows a similar impact for structural changes, such as China's transition from a command economy to a market-oriented economy. During this transition, the set of goods that made up the 10% of least traded goods from China to the U.S. in 1995, increased to nearly 25% of exports to the U.S. from China by 2005. However, this study is limited by not controlling for confounding factors. The current study addresses this by using a gravity model of trade and a much larger dataset.

These studies demonstrate that fixed costs are likely a crucial factor in determining the extensive margin of exports. It appears that lowering fixed costs may have a particularly large impact on a country's incentive to diversify their exports. The lower fixed costs may take the form of a trade liberalization or structural change of the economy, as in Kehoe & Ruhl (2009). It may also be the case that fixed costs are simply not a limiting factor for large economies, relative to smaller economies, allowing for firms to collectively export in more categories and subsequently have a larger extensive margin (Hummels & Klenow, 2005). The fiscal episodes investigated in this paper also have the potential to increase or decrease the fixed costs of exporting by inducing changes in interest rates.

[24]NAFTA was instituted in 1994. When the time period is widened, the extensive margin increases further.

3.2.2 Empirical support for the intensive margin

Helpman, Melitz & Rubinstein (2008) examine data for 158 countries for 1986 by first developing a theoretical model, from which they derive a gravity estimating equation.[25] One of the main innovations of their theoretical model is that it allows for zero trade flows and firm heterogeneity, but does not require firm-level data for estimation.[26] Incorporating zero trade flows between countries is important, as nearly half of the country pairs in the sample do not trade with each other. The extensive margin is defined as the number of exporting firms and the intensive margin is defined as trade volume per firm. This is similar to the current paper, except we define the extensive margin as the number of products exported and the intensive margin as trade volume per product. In their initial data analysis, Helpman *et al.* (2008) find that the majority of the growth in trade since 1970 occurs between countries that have an existing trade relationship, implying the intensive margin is the most important component of export growth. However, upon deriving an estimating equation and empirically testing this observation in the data, the authors find evidence suggestive of a complementary relationship between the intensive and extensive margins. First, a probit estimation determines the probability of positive trade flows, then non-linear least squares is used to assess the importance of various explanatory variables. The results show that lower trade barriers are not the only factor driving increased trade volumes. In addition, a greater proportion of exporters to a specific country, i.e. the extensive margin, also predicts higher trade volumes. So, while the intensive margin seems to comprise the majority of export growth, this is driven, at least in part, by the extensive margin.

Felbermayr & Kohler (2006) use the extensive and intensive margins of trade to

[25] The authors explain that their results are not particular to 1986, as they repeat empirical tests for all of the 1980s and find similar results. The year 1986 was chosen for convenience, as the paper is primarily methodological.

[26] See Helpman *et al.* (2008) for a detailed explanation.

investigate the "distance puzzle," for which past empirical evidence shows that trade volumes have become more sensitive to the geographic distance between countries over time. This is puzzling, of course, given the recent advances in transportation technology and subsequent decreases in transportation costs. As in Helpman *et al.* (2008), an important part of the authors' analysis is constructing a dataset that includes country pairs with zero trade flows. Since this type of data is not explicitly available, all missing observations are treated as zero trade flows, which the authors claim is justified on the grounds that approximately 80% of missing observations are found to actually be zeros when compared across data sources. Thus, the extensive margin is defined as variation in the number of active trading relationships that occur due to the formation of new trading relationships or the destruction of old relationships, or the trade in new products between countries that have a preexisting trading relationship. The intensive margin is defined as changes in the trade volumes of existing trading relationships. The focus lies on the period 1970-1990, for which the results show that the importance of distance diminishes over time when the extensive and intensive margins are measured appropriately, thus providing an explanation for the distance puzzle. Furthermore, the intensive margin explains the majority of export growth for the period, suggesting the extensive margin has an opportunity to play a larger role in future export growth.

Amurgo-Pacheco & Pierola (2008) also find that export growth is primarily determined along the intensive margin, especially for developed countries. They use a cross-section sample of 24 developed and developing countries over the period 1990-2005.[27] The authors follow the theoretical framework provided by Melitz (2003) and estimate bilateral trade flows using a gravity equation. The intensive margin is defined as changes in the volume of trade for existing trading relationships and the extensive margin is defined as establishing a new trading partner or exporting a new

[27] Amurgo-Pacheco & Pierola (2008) include four countries which are also considered in this paper: Australia, Canada, Japan, and the United States.

product to an existing trading partner, which are similar to the definitions used in this paper. Using Tobit estimation, the results show that the larger and closer the destination market, the higher is the growth in the volume of exports and the higher is the probability of an increase in the extensive margin of exports, with the former effect having the largest magnitude.

Besedes & Prusa (2010) add a new dimension to the literature by considering the dynamics of trading relationships over time, in contrast to previous models that look at one point in time or perform static comparisons of points in time. The study examines manufacturing exports for 46 countries over the period 1975-2003. The extensive margin is defined as establishing new trading partners and new export markets, and the intensive margin is defined as having existing trading relationships persist and/or deepen. A relationship is considered to persist if positive trade flows exist from one year to the next. "Deepening" is defined as an increase in the trade volume of existing relationships. Furthermore, any trading relationship that persists past one year is reclassified from the extensive margin to the intensive margin. The authors extend the model from Melitz (2003) and estimate hazard rates for trade relationships, and also decompose export growth into its respective margins.[28] The results show that the survival of trading relationships is most important for long-run export growth, implying that the majority of export growth occurs at the intensive margin, rather than the extensive margin. Moreover, there is much less export persistence in developing countries relative to developed countries, implying a critical part of improved export growth for developing countries may be focusing on existing relationships.

3.2.3 Fiscal Episodes

This paper draws largely on two sources from the fiscal episode literature, Alesina & Ardagna (2009) and Leigh *et al.* (2010). In Alesina & Ardagna (2009), the authors

[28]See Besedes & Prusa (2010) for more information concerning the estimation of hazard rates.

main focus is distinguishing between the growth effects of tax increases and spending cuts. Although such an exercise is outside the scope of the current study, the authors do identify episodes of fiscal consolidation and stimulus for 20 OECD countries, which are employed here to examine trade margins. Leigh *et al.* (2010) research a similar question, but use a different methodology to identify fiscal episodes, citing certain limitations in the methodology of Alesina & Ardagna (2009). As such, the authors develop a separate set of fiscal episodes, which are used as a robustness check in the current paper. In addition, they offer a brief discussion about exports, in which they show that net exports actually increase after a consolidation due to exchange rate depreciation and falling interest rates. Our study offers support for this result, but we go one step further in looking at the extensive and intensive margins.

Although the country coverage in the current paper is somewhat limited, the primary purpose is to gauge the response of the extensive and intensive margins of trade to fiscal episodes. This requires us to focus on countries for which fiscal episode data are available. However, we are able to extend the time coverage to 1970-2010, which is beyond that of previous studies. We use parsimonious definitions of the extensive and intensive margins of exports, consistent with earlier studies, and estimate a simple gravity model described in the next section.

3.3 Methodology, Data, and Results

3.3.1 Methodology and Data

As is common in the literature, OLS is employed on the following gravity model of trade:

$$\ln X_{h,i,t} = \alpha_0 + \alpha_1 F_{h,i,t} + \beta Z_{h,i,t} + \sum \alpha_2 EXP_h + \sum \alpha_3 IMP_i + \sum \alpha_4 YR_t + \epsilon_{h,i,t} \quad (7)$$

in which h is the exporter and i is the importer at time t. F represents the fiscal episode(s) under consideration. Z is a vector of control variables including distance between countries h and i, GDP per capita of the exporting and importing country, population of each country in a country-pair, the natural log of the product of the land area of each country in a country-pair, and the number of islands in the pair of countries (maximum of 2). In addition, dummy variables for whether the pair of countries were ever in a colonial relationship, share a common border, share a common language, are in a strict currency union, or are in a regional trade agreement are also included as controls. EXP, IMP, and YR are dummy variables for exporters, importers, and time, respectively. The time dummy variables control for time-specific unobservables that are similar across countries, such as business cycle effects. The exporter and importer dummy variables capture unobserved time-invariant heterogeneity that is specific to each country. As a robustness check, the following equation is also estimated:

$$\ln X_{h,i,t} = \alpha_0 + \alpha_1 F_{h,i,t} + \sum \alpha_2 CP_{h,i} + \sum \alpha_4 YR_t + \beta Z_{h,i,t} + \epsilon_{h,i,t} \tag{8}$$

whereby CP is a dummy variable for each country-pair, which replaces the exporter and importer dummy variables from Equation (7). This is to capture unobserved characteristics of each country-pair that may influence their trading relationship (e.g. geography, political relationships, etc.). Other time-invariant variables are encompassed by these dummies, meaning that coefficient estimates for characteristics such as sharing a common border or language cannot be estimated when these dummies are included. However, since this study considers primarily industrialized economies, unobserved factors relating to each country may be more important than unobserved common traits shared by a country-pair (Baller, 2007). Therefore, Equation (7), with exporter and importer fixed effects, is preferred in this context. The results from

estimating Equation (8), with country-pair dummies, are available in the Appendix.

The dependent variable, X, is a vector of the export variables of interest: total export volume, the extensive margin, and the intensive margin. Total exports are calculated as the log of the total volume of exports (in current US dollars), V, between an exporter and importer, and can be decomposed into the extensive and intensive margins of exports as follows:

$$\ln V_{h,i,t} = \ln N_{h,i,t} + \ln \frac{V_{h,i,t}}{N_{h,i,t}} \tag{9}$$

The extensive margin is defined as the log of the number of products that a country exports, N. The intensive margin is the log of the average volume of exports per product from country h to i, and is calculated by dividing the total volume of exports by the total number of products exported. Bernard *et al.* (2007), Amurgo-Pacheco & Pierola (2008), and Helpman *et al.* (2008), among others, define the margins similarly, although they are more interested in firm-level exports, as opposed to the country aggregates explored here.

The analysis covers the period 1970-2010 for the 20 OECD countries from the Alesina & Ardagna (2009) study. Bilateral export data are classified at the four-digit level of SITC revision 2, collected from the World Integrated Trade Solutions (WITS) database. Data for the control variables are taken from Andrew Rose's website.[29] Data for fiscal episodes are from Alesina & Ardagna (2009). Generally, a fiscal stimulus is an event during which the exporter's budget deficit increases in an attempt to stimulate aggregate demand. Fiscal consolidation is defined analogously, with policy aimed at decreasing the budget deficit in an attempt to reduce the overall debt level of an economy. The specific definition of these episodes is as follows: "A period of fiscal adjustment (stimulus) is a year in which the cyclically adjusted primary

[29]For more information, see: http://faculty.haas.berkeley.edu/arose/.

balance improves (deteriorates) by at least 1.5 percent of GDP."[30] For purposes of this paper, the fiscal stimuli and consolidation variables are constructed as dummy variables that take on a value of 1 during an episode and 0 otherwise. For example, if a fiscal stimulus occurs in 1980, then the corresponding dummy variable for period t will take on the value of 1 in 1980 and zero in all other years. For period $t+1$, the dummy variable takes on a value of 1 in 1981, but zero in all other years, indicating that a stimulus occurred in the prior year. The definition is analogous if the episode lasts multiple years. For example, if a stimulus takes place in 1982 and 1983 in a given country, then the stimulus dummy variable for time period t equals one in both 1982 and 1983, but zero in all other years. In period $t+1$, the fiscal stimulus variable will equal one in 1984, while it will equal zero in all other years, and so forth. 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.

Table 3.1 lists the number of occurrences of each type of episode, including instances when episodes happen simultaneously in an exporting and importing country.[31] Consider that there are 1,874 observations of a fiscal consolidation during the initial year of an exporter consolidation.[32] Given the nature of bilateral export data, a consolidation that occurs in, say, Australia in 1987 shows up as one observation when Australia trades with Canada in 1987 and again when Australia trades with the United States in 1987. Thus, a single episode in any given year in a country actually leads to many fiscal episode observations because of multiple trading partners. Columns 2-4 show that fiscal episode observations decrease in periods after the initial episode. There are a couple of factors that are driving this phenomenon. First,

[30] Alesina & Ardagna (2009), page 8. The authors use fiscal consolidation and fiscal adjustment interchangeably.

[31] Statistics for "Successful" fiscal episodes are also listed, but are discussed in greater detail in Section 3.3.6.

[32] There are 14,441 observations in our dataset. See Table B.1 for more information.

episodes that last consecutive years are identified as contemporaneously experiencing the episode for each of those years: for example, a fiscal episode during 1984-85 is treated as two current episodes (1984 and 1985). However, since $t+1$ refers to the year after an episode ends, the fiscal consolidation dummy variable only equals one during 1986 in this case, not 1985 and 1986, to avoid overlap between current episodes and episodes that have ended. Second, there are missing data for some control variables in subsequent years, which causes some observations to be omitted.

Table 3.1: Summary of Fiscal Episodes

Type of Episode	t	t+1	t+2	t+3
Exp. Consolidation	1,874	1,459	1,446	1,471
with Imp. Consolidation	395	222	216	222
with Imp. Stimulus	154	89	89	89
Imp. Consolidation	1,889	1,454	1,457	1,467
with Exp. Stimulus	156	89	89	89
Exp. Stimulus	1,607	1,228	1,228	1,228
with Imp. Stimulus	303	180	180	180
Imp. Stimulus	1,621	1,225	1,228	1,223
Successful Exp. Consolidation	383	312	294	314
Successful Imp. Consolidation	382	312	311	313
Successful Both Consolidation	8	6	5	6

3.3.2 Results

The results in Table 3.2 show the control variables that are included in each regression throughout the paper. These control variables are commonly included in gravity models in the trade literature (Rose & Spiegel, 2011, among others). As shown in Equation (9), the coefficient estimates of the extensive and intensive margins add up to equal total exports.[33] They are mostly all statistically significant and of the correct expected sign. For example, distance is negatively associated with both the extensive and intensive margins of trade, indicating that total trade decreases as the distance between trading partners increases. As the population of trading partners increases,

[33]There are instances when the extensive and intensive margins coefficients do not appear to sum to total exports, but this is solely due to rounding.

Table 3.2: Gravity Results for Control Variables Only

	Total Exports	Extensive	Intensive
Distance	-1.158***	-0.375***	-0.783***
	(0.069)	(0.035)	(0.056)
Population$_h$	0.621*	1.747***	-1.126***
	(0.328)	(0.169)	(0.337)
Population$_i$	1.216***	0.520***	0.696**
	(0.282)	(0.154)	(0.295)
Real GDP per capita$_h$	1.043***	0.252***	0.791***
	(0.088)	(0.036)	(0.085)
Real GDP per capita$_i$	0.637***	0.220***	0.417***
	(0.072)	(0.042)	(0.079)
Strict Currency Union	0.155***	0.001	0.154***
	(0.057)	(0.025)	(0.056)
Common Language	0.207**	0.152***	0.055
	(0.099)	(0.044)	(0.084)
Regional Trade Agreement	0.336***	0.069***	0.268***
	(0.054)	(0.024)	(0.054)
Common Border	-0.104	-0.282***	0.177
	(0.121)	(0.066)	(0.111)
No. of Islands	-0.476	3.755***	-4.231***
	(0.857)	(0.407)	(0.885)
Log Product of Land Area	0.094	-0.869***	0.963***
	(0.188)	(0.096)	(0.190)
Colony	0.616***	0.179**	0.437***
	(0.155)	(0.086)	(0.108)
Constant	-23.726***	-11.144***	-12.582**
	(5.015)	(2.835)	(5.370)
R^2	0.919	0.833	0.881
Observations	14,441	14,441	14,441
Year Effects	Yes	Yes	Yes
Exp. and Imp. Effects	Yes	Yes	Yes
Country-pair Effects	No	No	No

Note: Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

so does the trade between two countries, with the curious exception of the intensive margin in the exporting country. An increase in income is positively associated with each trade margin and, thus, total exports. Having a strict currency union appears to be positively associated with total exports, although this is entirely driven by the intensive margin. Sharing a common language or being a member of a regional trade agreement are traits that predict higher volumes of trade between countries.

Somewhat surprisingly, sharing a common border is negatively correlated with the extensive margin and statistically insignificant for the intensive margin and total exports. Increasing the number of islands in a country-pair is positively associated with the extensive margin and negatively associated with the intensive margin, while the opposite is true for the natural log of the product of the land area of the country-pair. Trade is predicted to be larger between countries that were once in a colonial relationship, with the intensive margin being the largest contributor to total exports in this instance.

3.3.3 Impact on Total Exports

Table 3.3 shows the effect of various fiscal episodes on the total export volume between two countries. The findings in the first four columns (i.e. time t to $t+3$) are from a single regression – the table is arranged in multiple rows and columns to show the marginal effect of the episodes over time. The estimates in the last column are formulated by summing across each row, then testing the null hypothesis that this sum of the coefficient estimates is equal to zero. The first column shows the immediate impact on total exports of a fiscal episode in one country of a country-pair. When an exporter experiences a consolidation, there is no statistically discernible effect on total exports in the year of the episode. However, one year and two years after the consolidation, total exports increase by 4.4% and 2.6%, respectively.[34] Three years after the end of a consolidation, the total volume of exports from country h to country i cumulatively increases 7%. While this is an economically large effect, an exporter that undergoes a fiscal stimulus experiences substantially larger effects, albeit in the opposite direction. The impact is the strongest in the year of the stimulus, during which total exports decline 7.4%. The cumulative decrease three years after the stimulus ends is 20.9%. When an importing country experiences a fiscal episode, the

[34]These are calculated as follows: [exp(0.043)-1]*100 and [exp(0.026)-1]*100, respectively. The fiscal episode results in remainder of the paper are interpreted identically.

impact on total exports is negative, although this is only statistically significant in the year of the episode. The magnitude of the total effect is relatively large, as in the case of an exporter episode, but is statistically insignificant. The magnitudes are also similar whether the importer has a consolidation or stimulus. From these results, it appears that fiscal episodes have a greater impact on the total volume of exports when the exporter experiences the episode. In general, a consolidation increases total exports, with most of this increase occurring in the first two years after the consolidation has taken place. This is consistent with Leigh *et al.* (2010), who show that a decrease in interest rates and exchange rate depreciation accompany a fiscal consolidation, prompting an increase in exports. Although Leigh *et al.* (2010) do not address fiscal stimuli in their study, it logically follows that exchange rate appreciation and an increase in interest rates likely occurs as a result of a fiscal stimulus, leading to a decrease in total exports which the current results corroborate.

Table 3.3: Conditional Effects of Fiscal Episodes on Total Exports

	t	t+1	t+2	t+3	Total
Exp. Cons.	0.003	0.043***	0.026**	-0.004	0.068*
	(0.011)	(0.011)	(0.011)	(0.011)	(0.037)
Exp. Stim.	-0.077***	-0.051***	-0.053***	-0.054***	-0.235***
	(0.012)	(0.013)	(0.013)	(0.012)	(0.044)
Imp. Cons.	-0.026**	-0.013	-0.015	-0.016	-0.071
	(0.012)	(0.013)	(0.012)	(0.012)	(0.043)
Imp. Stim.	-0.032**	-0.020	-0.019	-0.008	-0.079
	(0.014)	(0.014)	(0.014)	(0.013)	(0.050)
R^2	0.919				
Observations	14,441				
Year Effects	Yes				
Exp. and Imp. Effects	Yes				
Country-pair Effects	No				

Note: These are the estimated marginal effects when the indicated fiscal episode occurs in period t. The results are from a single regression, but are presented in multiple columns for readability. In addition, the control variables from Table 3.2 are included in the regression, but the coefficient estimates are omitted here for space considerations. Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

Table 3.4: Marginal Effects of Fiscal Episodes Occurring Simultaneously in Each Country (Total Exports)

	t	t+1	t+2	t+3	Total
Exp. and Imp. Cons.	-0.023	0.030	0.011	-0.021	-0.003
	(0.016)	(0.018)	(0.018)	(0.017)	(0.061)
Exp. and Imp. Stim.	-0.109***	-0.072***	-0.072***	-0.062***	-0.315***
	(0.019)	(0.019)	(0.019)	(0.018)	(0.068)
Exp. Cons. and Imp. Stim.	-0.029	0.023	0.007	-0.012	-0.011
	(0.018)	(0.018)	(0.018)	(0.017)	(0.064)
Exp. Stim. and Imp. Cons.	-0.102***	-0.065***	-0.068***	-0.071***	-0.306***
	(0.017)	(0.018)	(0.017)	(0.017)	(0.062)

Note: Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

Leigh *et al.* (2010) argue that episodes occurring simultaneously in many countries are an increasingly important consideration, given the current economic climate. Furthermore, Table 3.1 shows that this is a relatively common occurrence in the data. Thus, Table 3.4 shows the effect of both countries in a country-pair experiencing a fiscal episode simultaneously. When both countries have a fiscal consolidation, the signs and magnitudes of the coefficient estimates are mixed but statistically insignificant. The same is true when an exporter undergoes a consolidation and an importer undergoes a stimulus. However, when an exporting country has a fiscal stimulus, the impact on total exports is negative and large. The effect is similar whether the importing country has a consolidation or a stimulus, and the effects are strongest in the year of the fiscal episode. This evidence again demonstrates the large and negative impact of fiscal stimuli, which seems to become more pronounced when an importing country experiences a fiscal episode of either type. However, the positive effects of fiscal consolidation disappear, in both magnitude and statistical significance, when an importing country also has a fiscal episode. In the following sections, total exports are decomposed into the extensive and intensive margins to elucidate differences in how each margin contributes to the change in total exports and responds to fiscal episodes.

3.3.4 Impact on the Extensive Margin

Table 3.5 presents the results for the extensive margin of exports. As with total exports, a fiscal consolidation is associated with an increase in the extensive margin. The effect appears to strengthen in the periods after the initial episode, with a cumulative increase of 16.3%. Recall that the extensive margin refers to the number of products being exported. The average number of products exported by a given country in this sample is 360, meaning a fiscal consolidation is associated with nearly 59 new products being exported, cumulatively, three years after the consolidation. A fiscal stimulus in an exporting country prompts a large initial decrease in the extensive margin of 4.5%, with the impact weakening over time. The cumulative decrease is quite strong, with a total decline of 12.5%. Interestingly, episodes in importing countries do not significantly affect the extensive margin.

Table 3.5: Conditional Effects of Fiscal Episodes on the Extensive Margin

	t	t+1	t+2	t+3	Total
Exp. Cons.	0.013**	0.050***	0.053***	0.035***	0.151***
	(0.006)	(0.005)	(0.006)	(0.005)	(0.018)
Exp. Stim.	-0.046***	-0.042***	-0.025***	-0.023***	-0.134***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.021)
Imp. Cons.	0.005	0.009	0.008	0.009	0.031
	(0.006)	(0.007)	(0.007)	(0.007)	(0.023)
Imp. Stim.	-0.011	-0.004	-0.001	0.003	-0.012
	(0.007)	(0.007)	(0.007)	(0.007)	(0.025)
R^2	0.833				
Observations	14,441				
Year Effects	Yes				
Exp. and Imp. Effects	Yes				
Country-pair Effects	No				

Note: These are the estimated marginal effects when the indicated fiscal episode occurs in period t. The results are from a single regression, but are presented in multiple columns for readability. In addition, the control variables from Table 3.2 are included in the regression, but the coefficient estimates are omitted here for space considerations. Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

Considering episodes occurring simultaneously in both countries of a country-pair, in Table 3.6, yields similar results. When an exporting country undergoes a fiscal

consolidation, the resulting impact on the extensive margin is positive. However, the effect appears to be somewhat larger when an importing country also experiences a consolidation. In each case, the effects are strongest in the two years after the episode ends (i.e. $t+1$ and $t+2$). When an exporting country has a fiscal stimulus, the yearly and cumulative effects are also strong except, in this case, the extensive margin decreases. The decrease is largest when both countries have a fiscal stimulus. Furthermore, the decline is deepest during the year the stimulus initially take place and weakens over time. The same pattern holds true when an exporter has a stimulus while an importer undergoes a consolidation, except the coefficient estimates are smaller than when both countries have a stimulus.

Table 3.6: Marginal Effects of Fiscal Episodes Occurring Simultaneously in Each Country (Extensive Margin)

	t	t+1	t+2	t+3	Total
Exp. and Imp. Cons.	0.017**	0.059***	0.061***	0.044***	0.182***
	(0.008)	(0.009)	(0.010)	(0.009)	(0.032)
Exp. and Imp. Stim.	-0.057***	-0.046***	-0.026***	-0.020**	-0.148***
	(0.010)	(0.009)	(0.009)	(0.010)	(0.034)
Exp. Cons. and Imp. Stim.	0.002	0.046***	0.052***	0.039***	0.139***
	(0.009)	(0.009)	(0.009)	(0.008)	(0.031)
Exp. Stim. and Imp. Cons.	-0.041***	-0.033***	-0.017*	-0.014	-0.105***
	(0.009)	(0.009)	(0.009)	(0.010)	(0.034)

Note: Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

3.3.5 Impact on the Intensive Margin

The intensive margin of exports is affected quite differently than the extensive margin after a fiscal consolidation, as evidenced by the results in Tables 3.7 and 3.8. Both types of fiscal episodes negatively impact the intensive margin, regardless of whether the exporter, importer, or both countries simultaneously experience an episode. Table 3.7 shows that the cumulative decrease in the intensive margin is virtually the same when either an exporting country has a stimulus or an importing country has a

consolidation, with declines of 9.6% and 9.5%, respectively. A consolidation in an exporting country results in a decline of the intensive margin by a total of 8%, whereas a stimulus in an importing country has no statistically significant effect.

Table 3.7: Conditional Effects of Fiscal Episodes on the Intensive Margin

	t	t+1	t+2	t+3	Total
Exp. Cons.	-0.010	-0.007	-0.026**	-0.040***	-0.083**
	(0.010)	(0.011)	(0.010)	(0.010)	(0.036)
Exp. Stim.	-0.031***	-0.009	-0.028**	-0.031***	-0.101**
	(0.011)	(0.012)	(0.012)	(0.011)	(0.040)
Imp. Cons.	-0.031***	-0.022*	-0.023**	-0.025**	-0.100**
	(0.011)	(0.012)	(0.011)	(0.011)	(0.039)
Imp. Stim.	-0.021	-0.017	-0.018	-0.011	-0.067
	(0.013)	(0.013)	(0.013)	(0.013)	(0.048)
R^2	0.881				
Observations	14,441				
Year Effects	Yes				
Exp. and Imp. Effects	Yes				
Country-pair Effects	No				

Note: These are the estimated marginal effects when the indicated fiscal episode occurs in period t. The results are from a single regression, but are presented in multiple columns for readability. In addition, the control variables from Table 3.2 are included in the regression, but the coefficient estimates are omitted here for space considerations. Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

Table 3.8: Marginal Effects of Fiscal Episodes Occurring Simultaneously in Each Country (Intensive Margin)

	t	t+1	t+2	t+3	Total
Exp. and Imp. Cons.	-0.041***	-0.030*	-0.049***	-0.065***	-0.184***
	(0.015)	(0.017)	(0.016)	(0.016)	(0.057)
Exp. and Imp. Stim.	-0.052***	-0.026	-0.046***	-0.042**	-0.167**
	(0.018)	(0.019)	(0.018)	(0.017)	(0.065)
Exp. Cons. and Imp. Stim.	-0.031*	-0.024	-0.045***	-0.051***	-0.150**
	(0.017)	(0.017)	(0.017)	(0.016)	(0.061)
Exp. Stim. and Imp. Cons.	-0.062***	-0.032*	-0.051***	-0.057***	-0.201***
	(0.017)	(0.017)	(0.016)	(0.016)	(0.058)

Note: Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

When countries experience episodes simultaneously, the largest decreases in the

intensive margin occur when an importing country has a fiscal consolidation. When an importer undergoes a stimulus and an exporting country also experiences a fiscal episode, the decline in the intensive margin is also statistically significant, although not as severe as when the importer has a consolidation.

3.3.6 Successful Fiscal Consolidations

Alesina & Ardagna (2009) also consider the effects of what they deem "successful" fiscal consolidations, in which "the cumulative reduction of the debt to GDP ratio three years after the beginning of a fiscal adjustment is greater than 4.5 percentage points."[35] Referring back to Table 3.1, notice that successful fiscal consolidations are a small subset of total fiscal consolidations. It is interesting to see that the percentage increase in total exports after a successful fiscal consolidation is twice that in Table 3.3 (14% compared to 7%), but that the increase in total exports is again entirely driven by the increase in the extensive margin of exports. The intensive margin appears to play a very limited role in this scenario. Although results are also reported here for when an exporting and importing country undergo a successful fiscal consolidation simultaneously, these cases are so rare that they should be interpreted with caution.

3.3.7 Comparison Using IMF Definition of Fiscal Consolidation

Thus far, the fiscal episodes in this paper have been based on the definitions put forth by Alesina & Ardagna (2009). However, as discussed previously in Section 3.2.3, Leigh *et al.* (2010) develop a new definition of fiscal consolidation, citing concerns with limitations of previous definitions. Specifically, 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

[35] Alesina & Ardagna (2009), pages 8-9.

Table 3.9: Conditional Effects of Successful Fiscal Consolidation

	t	t+1	t+2	t+3	Total
Total Exports:					
Exp. Cons.	0.014	0.070***	0.060***	-0.013	0.131*
	(0.024)	(0.022)	(0.022)	(0.020)	(0.077)
Imp. Cons.	0.005	0.012	-0.004	-0.036*	-0.023
	(0.020)	(0.021)	(0.022)	(0.020)	(0.072)
Exp. and Imp. Cons.	0.018	0.082**	0.056*	-0.049	0.108
	(0.032)	(0.033)	(0.033)	(0.030)	(0.113)
Extensive Margin:					
Exp. Cons.	0.030***	0.039***	0.070***	-0.003	0.136***
	(0.009)	(0.009)	(0.011)	(0.008)	(0.031)
Imp. Cons.	0.008	0.009	0.003	-0.002	0.017
	(0.011)	(0.011)	(0.012)	(0.012)	(0.040)
Exp. and Imp. Cons.	0.038**	0.047***	0.073***	-0.005	0.153***
	(0.015)	(0.015)	(0.017)	(0.016)	(0.055)
Intensive Margin:					
Exp. Cons.	-0.016	0.031*	-0.010	-0.010	-0.005
	(0.020)	(0.018)	(0.020)	(0.018)	(0.066)
Imp. Cons.	-0.003	0.003	-0.007	-0.033*	-0.040
	(0.019)	(0.019)	(0.019)	(0.017)	(0.064)
Exp. and Imp. Cons.	-0.019	0.035	-0.017	-0.044	-0.045
	(0.027)	(0.028)	(0.030)	(0.026)	(0.098)
Observations	14,441				
Year Effects	Yes				
Exp. and Imp. Effects	Yes				
Country-pair Effects	No				

Note: Separate regressions are run for Total Exports, the Extensive Margin, and the Intensive Margin, in which dummy variables are included for exporter and importer consolidations in t through $t+3$. These are the estimated marginal effects when the indicated fiscal episode occurs in period t. In addition, the control variables from Table 3.2 are included in each regression, but the coefficient estimates are omitted here for space considerations. Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

actions countries actually take. As is evident in Table 3.10 by the fewer instances of consolidation, their sample is much smaller than that of Alesina & Ardagna (2009), with only 15 OECD countries for the period 1980-2009.

They also do not consider fiscal stimuli, but the episodes they identify serve as a good robustness check for the case of fiscal consolidation. Indeed, the results in

Table 3.10: Summary of Fiscal Episodes (IMF Definition)

Type of Episode	t	t+1	t+2	t+3
Exp. Consolidation	431	263	254	254
Imp. Consolidation	429	262	254	254
Both Consolidation	58	28	28	28

Table 3.11 show that a consolidation in an exporting country is associated with a relatively large increase in total exports, as in our previous results. However, in this case the intensive margin also contributes to the increase in total exports. In fact, it is hard to determine which trade margin plays the biggest role in the increase of total exports, as an exporter consolidation leads to an increase in the extensive margin in periods $t+1$ and $t+2$, and an increase in the intensive margin in periods t and $t+1$. The magnitudes are slightly larger for the intensive margin, but the total impact is statistically insignificant for each margin. Episodes in importing countries are statistically insignificant with coefficient estimates near zero, consistent with earlier results. Overall, the results using the IMF definition of fiscal consolidation compare favorably to the earlier results. However, the much smaller sample size invites caution when comparing the two sets of results.

3.4 Discussion

This paper demonstrates the importance of fiscal episodes to the extensive and intensive margins of trade, as well as the overall volume of exports. Large changes in the fiscal stance of a country are shown to have a substantial impact on their trading relationships. There are essentially two types of scenarios that are relevant from a policy standpoint, the first of which is much more common in the current dataset: 1) When a fiscal episode occurs in an exporting country, and, 2) When a fiscal episode occurs in both countries of a country-pair simultaneously. A consolidation in an exporting country results in an increase in the extensive margin of over 16% and an increase in the total volume of exports by nearly 7%. For large fiscal consolidations,

Table 3.11: Conditional Effects of Fiscal Consolidation (IMF Definition)

	t	t+1	t+2	t+3	Total
Total Exports:					
Exp. Cons.	0.059*	0.094***	0.028	-0.019	0.162*
	(0.032)	(0.034)	(0.021)	(0.020)	(0.095)
Imp. Cons.	0.003	-0.037	-0.023	-0.028	-0.085
	(0.029)	(0.025)	(0.021)	(0.021)	(0.083)
Exp. and Imp. Cons.	0.062	0.057	0.005	-0.046	0.078
	(0.044)	(0.041)	(0.030)	(0.030)	(0.123)
Extensive Margin:					
Exp. Cons.	0.007	0.049**	0.026**	-0.012	0.069
	(0.017)	(0.024)	(0.012)	(0.009)	(0.059)
Imp. Cons.	0.004	0.003	-0.002	-0.004	0.001
	(0.013)	(0.011)	(0.011)	(0.011)	(0.039)
Exp. and Imp. Cons.	0.011	0.052*	0.024	-0.016	0.071
	(0.021)	(0.027)	(0.017)	(0.015)	(0.074)
Intensive Margin:					
Exp. Cons.	0.052*	0.045**	0.002	-0.006	0.093
	(0.028)	(0.022)	(0.016)	(0.016)	(0.071)
Imp. Cons.	-0.001	-0.040*	-0.021	-0.024	-0.086
	(0.026)	(0.021)	(0.016)	(0.017)	(0.067)
Exp. and Imp. Cons.	0.051	0.004	-0.019	-0.030	0.007
	(0.041)	(0.031)	(0.023)	(0.024)	(0.101)
Observations	5,965				
Year Effects	Yes				
Exp. and Imp. Effects	Yes				
Country-pair Effects	No				

Note: Separate regressions are run for Total Exports, the Extensive Margin, and the Intensive Margin, in which dummy variables are included for exporter and importer consolidations in t through $t+3$. These are the estimated marginal effects when the indicated fiscal episode occurs in period t. In addition, the control variables from Table 3.2 are included in the regression, but the coefficient estimates are omitted here for space considerations. Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

known as "successful" fiscal consolidations in this study, the increase in total exports is approximately 14.5% and is driven entirely by changes in the extensive margin. Leigh *et al.* (2010) show that a decrease in interest rates usually follows a fiscal consolidation, meaning that countries may use a fiscal consolidation as a time to invest and expand their product lines, which is consistent with an increase in the extensive

margin. These results are robust to using the IMF definition of fiscal consolidation, which shows an increase in total exports of over 17.5%. However, a fiscal stimulus in an exporting country results in a decline in the extensive and intensive margin, yielding a decrease in total exports of over 21%. Although these results do not shed light on the type of fiscal policy used to prompt the fiscal episode, or the exact mechanism that is causing the change in exports, the implication is that policy-makers should take these potential consequences into account when considering changes in fiscal policy.

When an exporting and importing country simultaneously experience an episode, total exports are only significantly affected by a stimulus in the exporting country. In this case, the decline in total exports is approximately 27%, regardless of whether the importing country has a stimulus or consolidation. Thus, the decline in exports following a fiscal stimulus in an exporting country appears to be deeper if the importing country also experiences a fiscal episode. Although the extensive and intensive margins each contribute to the decline in total exports, the intensive margin declines relatively more in the case of a stimulus. When an exporting country undergoes a fiscal consolidation and an importing country also has a fiscal episode, the positive effects of the extensive margin are offset by the negative effects of the intensive margin so that the impact on total exports is close to zero and statistically insignficant. This is especially relevant in today's policy arena as many governments are considering fiscal consolidation measures. The results suggest that an increase in total exports should not be expected if a country's trading partner has recently experienced a fiscal consolidation.

Although we are unable to identify the exact mechanism that is causing the change in exports following a fiscal episode, there are recent studies that shed light on some possibilities. For example, Leigh *et al.* (2010) show that a country typically experiences an exchange rate depreciation as well as a decrease in interest rates following

a fiscal consolidation, which tends to increase exports. The current study confirms this and makes sense intuitively, as firms may use the drop in interest rates and exchange rate depreciation brought about by fiscal consolidation as an opportunity to expand their product line. Leigh *et al.* (2010) do not address fiscal stimuli, but it naturally follows that if a consolidation is associated with an increase in exports due to decreases in interest rates and the exchange rate, then a fiscal stimulus is likely to be associated with a decrease in exports due to an increase in interest rates and the exchange rate. Indeed, our results support this possibility.

The current paper is focused specifically on gauging the response of exports to various fiscal episodes in bilateral trading relationships. However, there are natural extensions worth further research. For example, it may be interesting to measure the extensive margin in a more detailed way. That is, rather than simply counting the number of categories in which a country exports, construct a weighted measure of the extensive margin, whereby goods that compose a larger percentage of total trade are weighted higher than those that are a smaller proportion of total trade. This would also allow for a more specific measurement of the intensive margin, by giving more weight to those products that make up a larger share of total exports. Adding more countries to the study and doing a comparison with developing countries may also be fruitful. From a policy perspective, it may be worthwhile to consider the potential asymmetric impact of tax changes versus changes in spending as the source of the fiscal episode. Moreover, determining the exact mechanism responsible for the change in total exports and the respective trade margins, be it changes in interest rates, exchange rates, or something else entirely, may be useful for future policy prescriptions.

4 Macroeconomic Policy, Disaggregated Exports, and Economic Growth: A Simultaneous Equations Approach

4.1 Introduction

Given the increasingly global nature of the economy, any analysis of the efficacy of various macroeconomic policies on economic growth should also incorporate the increasing role of exports into the framework. Recent empirical studies offer mixed results on the impact of exports and macroeconomic policy – monetary policy and fiscal policy – on economic growth. The extant literature takes a rather fragmented approach to measuring these policies, using various indices, proxies, and econometric techniques. Furthermore, given the importance of the impact of trade on growth, relatively little attention is paid to the possible indirect effect of macroeconomic policy on economic growth through the export channel. Thus, the contributions of this paper are twofold. First, I explore the determinants of disaggregated exports – primary and manufacturing exports – to empirically test whether macroeconomic policy does indeed influence the size of the export sector in a given country. Second, I use simultaneous equations methods to identify the impact of macroeconomic policy and exports on economic growth. The results offer support for the idea that macroeconomic policy directly affects export levels and also demonstrate that exports affect economic growth. However, the evidence demonstrating a direct link between macroeconomic policy and growth is much weaker.

The paper proceeds as follows. Section 2 explores the relevant literature on the relationship between macroeconomic policy, exports, and economic growth. Section 3 discusses the theory and methodology. Section 4 presents the data and results. Section 5 concludes.

4.2 Background

4.2.1 Macroeconomic policy and economic growth

Since price stability is a principal goal of macroeconomic policy, early studies focus heavily on the relationship between inflation and economic growth. Bleaney (1996) finds no relationship between inflation and growth. However, he truncates the maximum inflation rate at 100% to avoid "outliers," which, according to Bruno & Easterly (1998), are the source of the negative relationship between inflation and economic growth. Indeed, Bruno & Easterly (1998) provide evidence that high-inflation crises are particularly harmful to growth, as they find a negative relationship between inflation and growth only during periods when inflation is above a threshold level of 40% per year. Fischer (1991, 1993) demonstrates that countries with low levels of inflation grow much faster than those with high levels of inflation, and that high inflation also impedes growth by discouraging physical capital investment. Barro (1996) finds, on average, that a 10 percentage point increase in inflation is associated with a decrease in the GDP growth rate of 0.24 percentage points. Upon further investigation, he finds that the negative relationship between inflation and growth only holds for those countries with inflation rates above 20% per year. Durlauf, Kourtellos & Tan (2008) use Bayesian Model Averaging to test the robustness of various growth theories, including a theory that macroeconomic policy variables are important determinants of a country's growth process. They use panel data covering three time periods, 1965-74, 1975-84, and 1985-94 for 53, 54, and 57 countries, respectively. Their results show that growth rates are positively correlated with improvements in macroeconomic policy variables, specifically inflation and government consumption. A theme that emerges from the literature, as noted by Bruno & Easterly (1998), is that extremely high rates of inflation tend to be significantly negatively associated with long-run growth and that the inflation-economic growth relationship weakens as

data frequency decreases.

While certainly important, inflation is not the only available macroeconomic policy indicator. Bleaney (1996) analyzes a cross-section of 41 developing countries for the period 1980-90, and a smaller sample of countries over the period 1972-90, and finds that changes in growth rates are positively correlated with improvements in macroeconomic policies, for a given level of investment. Macroeconomic policies are evaluated using five different measures of debt, inflation, and exchange rates, in which the fiscal balance and exchange rate volatility are found to be the most highly correlated with economic growth. Bleaney posits that including exchange rate volatility in the same regression as the inflation rate, which are highly positively correlated, may partially explain why inflation does not enter significantly – perhaps because it has proxied for exchange rate volatility in prior work. Combined with the previous studies he cites, Bleaney explains this evidence "suggests that variability of the real exchange rate is an important aspect of policy-induced macroeconomic instability that adversely affects performance."[36] Rodrik (2008) examines data on 188 countries over the time period 1950-2004 to investigate the relationship between the real exchange rate and economic growth. Using several measures of under/over-valuation of the real exchange rate and various estimation techniques, he concludes that undervaluation prompts economic growth. Moreover, he finds that when a country's currency is significantly overvalued their export sector suffers much more than the non-export sector. My analysis takes this idea one step further and allows for heterogeneity across exports by disaggregating the export sector into its manufacturing and primary components.

Other studies, such as Montiel & Servén (2006), find no discernible evidence that improving macroeconomic policy is beneficial to a country's growth process. They analyze data from 1960-2003 and explain that developing countries have generally

[36]Bleaney (1996), p. 466.

improved their macroeconomic policies over time, yet have not seen the anticipated growth advantages from doing so. Bigsten *et al.* (1999) attempt to model the quality of macroeconomic policy through a measure of country openness known as the Dollar index, which is a measure of how much domestic prices are above/below international prices.[37] Although they find no significant impact on exports from changes in the level of openness, they only analyze firm-level data for four countries covering the time period 1991-95 and therefore recommend using caution when interpreting their results. Hausmann, Pritchett & Rodrik (2005) examine growth accelerations, defined as an increase in GDP per capita growth of 2 percentage points that is sustained for at least 8 years, in which the post-acceleration annual growth rate is at least 3.5 percent. They look at 110 countries over the period 1957-92 and find that these accelerations are not usually preceded by changes in economic policies, implying that macroeconomic policy may have little or no impact on sustained economic growth.

Thus, evidence is mixed concerning the relationship between macroeconomic policy and growth. The extent to which these policies may affect growth appears to depend, at least in part, on how the policies are defined as well as the countries and time period selected for study. I attempt to address this by using a variety of macroeconomic policy indicators, a long time period, and numerous countries. Equally important in the present study is the role of exports, which is explored in more detail in the next section.

4.2.2 Macroeconomic policy and exports

In theory when the exchange rate in a given country appreciates, exports from that country become more expensive relative to non-export products. Thus, one would expect exports, on average, to decrease under such circumstances. Moreover, Collier & Gunning (1999) cite the presence of a "Dutch disease" effect, whereby exporting large

[37] See Bigsten *et al.* (1999), or the appendix of Sirimaneetham & Temple (2009) for a more detailed exposition of the Dollar Index.

quantities of natural resources, as is typically the case in developing countries, can lead to an appreciation of the exchange rate, hurting the manufacturing export sector much more than the primary export sector. Whereas some countries in East Asia and Latin America have promoted their manufacturing export sector over the past few decades, this is not true of all developing countries, particularly those in Africa. In addition to a reliance on primary exports, it is not uncommon for developing countries to have overvalued exchange rates, tariffs, and taxes that are unfavorable to exporting. As Collier & Gunning (1999) point out, these types of policies are much more harmful to "transaction-intensive" sectors like manufacturing. Furthermore, such policies make the black market an attractive alternative for selling products. The informal nature of the agriculture sector, in addition to typically being less capital-intensive, makes it a less risky venture than the manufacturing sector, thus providing for an easier transition to the black market when prompted by unfavorable macroeconomic policies. This stifles production in the manufacturing sector and the positive spillovers that would arise from it, thereby contributing to the slow economic growth of many developing countries over the past few decades.

The literature clearly shows that exports and macroeconomic policies play an important role in the economic growth process of a country. However, much of the current empirical work implicitly assumes that only direct effects exists from macroeconomic policies and/or exports to economic growth. I take an alternative approach in the next section by considering the effects of policy variables on exports and the indirect effect of policy variables on economic growth through the use of simultaneous equations methods.

4.3 Theory and Methodology

4.3.1 Theory

Past empirical research suggests that the macroeconomic stability of a country may directly influence its volume of exports and economic growth rate. However, since exports are also vitally important to a country's growth performance, macroeconomic policy may also exert an indirect effect on growth through its influence on exports. Therefore, in thinking of the importance of macroeconomic policy and exports in the growth process, it is perhaps more appropriate to model them separately, in a system of equations, rather than with a single estimating equation. This serves not only to more accurately measure the marginal effect of exports on growth, but also to determine the relative importance of macroeconomic policy indicators.

Esfahani (1991) argues that a simultaneous equations approach is necessary because although GDP growth is a function of exports, export growth is also a function of GDP growth. Estimating a single equation with exports as an explanatory variable may overstate the importance of exports to economic growth. Thus, it is optimal to have an export equation in addition to an economic growth equation. However, Esfahani (1991) only considers GDP per capita, population, and their respective growth rates as determinants of the level of exports. Price measures that may indicate the relative competitiveness of the export sector are not considered; human capital is not considered in either the exports or economic growth equations. Sprout & Weaver (1993) do include a price competitiveness measure as a potential exports determinant, in addition to the rate of economic growth, the growth of a country's main trading partners, and a measure of export composition and concentration. Sprout & Weaver (1993) construct their export composition measure by adding the share of primary products in total exports and the share of the two largest export commodities in total exports, then dividing by two. I take a similar approach, except I disaggregate

exports into its manufacturing and primary components for use as the dependent variables in the export equations and the explanatory variables in the economic growth equation. Greenaway & Sapsford (1994) investigate the importance of liberalization policies to exports and growth, yet find little support for the idea that a country that undergoes a trade policy liberalization will experience higher export and economic growth. While highlighting the potentially important role government policy may play in determining export and economic growth, the study is limited by the narrow scope of policies considered. I take a broader approach by looking at changes in various macroeconomic policies to see if the dynamics are different between the short run and long run, rather than looking at strict "episodes" of liberalization.

The exports and economic growth equations in the following section are based on a production function approach, in which $Y = A*f(K, H, L)$ and $X = g(Y, K, H, L, P, M)$. Y is total output, A is technology, K is physical capital, H is human capital, L is labor, P is price competitiveness, and M is macroeconomic policy indicators. Using a Cobb-Douglas functional form and following the contributions of Solow (1956), Mankiw, Romer & Weil (1992), and Tyler (1981), output is modeled as follows:

$$Y_{i,t} = A_{i,t} K_{i,t}^{\alpha} H_{i,t}^{\beta} L_{i,t}^{\gamma} \tag{10}$$

for country i during period t. A_{it} depends on the initial level of technology in a country, macroeconomic policy, and the rate of technological progress, similar to Mankiw *et al.* (1992), among others:

$$A_{i,t} = A_0 e^{g_{i,t}} M_{i,t} \tag{11}$$

Technological progress, g, depends in part on the level of exports, so that:

$$g_{i,t} = \eta + \theta X_{i,t} \tag{12}$$

The level of exports is determined similarly, with physical capital, human capital, and labor growth playing an important role. In addition, it is important to control for economic growth, the relative competitiveness of the export sector, and macroeconomic policy, as these also influence the overall level of exports (Sprout & Weaver, 1993; Greenaway & Sapsford, 1994).

4.3.2 Methodology

Thus, I estimate the following system of reduced-form equations:

$$x_{it} = \eta_{i1} + \mu_{t1} + \alpha_1 k_{i,t-1} + \beta_1 h_{i,t-1} + \gamma_1 l_{i,t-1} + \delta_1 t_{i,t-1} + \varphi_1 r_{i,t-1} + \kappa_1 m_{i,t-1} + \theta_7 y_{i,t-1} + \epsilon_{it1} \quad (13)$$

$$y_{it} = \eta_{i2} + \mu_{t2} + \alpha_2 k_{i,t-1} + \beta_2 h_{i,t-1} + \gamma_2 l_{i,t-1} + \theta_1 x_{i,t} + \kappa_2 m_{i,t-1} + \epsilon_{it2} \quad (14)$$

for country i over time period t, in which x is a vector of the export variables of interest, including total merchandise exports as a share of GDP, manufacturing exports as a share of GDP, and primary exports as a share of GDP.[38] y is GDP per capita growth, and η and μ control for country-fixed effects and time effects, respectively. Traditional control variables are included, wherein k is physical capital investment, h is human capital investment, and l is the growth rate of labor (see Levine & Renelt, 1992, among many others). The tariff rate, t, and the volatility of the real effective exchange rate index, r, are only included in the export equation, in an effort to control for the openness of a country and the stability of the exchange rate. These additional variables in the export equation also make the system over-identified, which is an important factor in determining an estimation method. m is a vector of the macroeconomic policy indicators of interest, which are discussed in more detail in the next section.

[38] Detailed variable definitions are available in the Appendix.

Equation (13) is estimated first, in both the cross-section and panel context, using ordinary least squares (OLS) in an effort to identify the effect of macroeconomic policy on the level of exports in a country. This is done using total exports, manufacturing exports, and primary exports as dependent variables. Then, I consider possible indirect effects of macroeconomic policy on growth through the export channel, using the two-step IV-GMM estimation technique, again in a cross-section and panel context. These results are discussed in the following section.

4.4 Data and Results

4.4.1 Data

The majority of the data are collected from the World Bank's 2010 World Development Indicators database over the sample period 1990-2009.[39] The education data are from Barro & Lee (2010) and government debt data are from Jaimovich & Panizza (2010). Equation (13) is estimated below, using both cross-section and panel estimation techniques to check for the robustness of relationships between the explanatory variables and exports over the short run and long run. The dependent variables are total merchandise exports, manufacturing exports, and primary exports, respectively; each export variable is scaled by GDP and logged. In the cross-sectional case, the export variables are averaged over the entire sample period and the explanatory variables are ten-year averages, from 1990-1999, to mitigate endogeneity concerns. In the panel case, all data are in five-year averages and all explanatory variables are lagged one period.[40]

Some discussion is warranted on the macroeconomic policy indicators of interest. In general, perceived improvements in macroeconomic policy indicators are subjective and this should be kept in mind when interpreting the results. There are six vari-

[39]Data from previous periods are too sparse and unreliable to allow for more comprehensive time coverage.

[40]Detailed variable descriptions are available in the Appendix.

ables included here, chosen on the basis of data availability and their use in previous studies. For some, the reason for inclusion is quite obvious. Inflation, for example, has been widely used in past empirical studies (Fischer, 1991, 1993; Bruno & Easterly, 1998), in which high inflation is usually associated with low or diminished growth. Moreover, many countries set inflation targets, making inflation a sufficient indicator of macroeconomic policy. However, inflation volatility is also included because while extremely high rates of inflation are found to be detrimental to economic growth in previous studies, the volatility of inflation may be equally important. Since exports are an important part of economic activity, inflation volatility is expected to be negatively associated with the level of exports. For others, such as the ratio of government debt to GDP, the argument for inclusion may be less apparent. For example, a country that is highly indebted may inadvertently discourage investment due to higher interest rates or fears of increased tax liabilities in the future. In turn, it becomes more difficult and less likely that the export sector will expand, meaning the country will not experience the positive externalities resulting from exporting. The adverse impact of an indebted government will likely affect the manufactured goods export sector more than the primary goods export sector because of the higher returns and possibility of positive externalities associated with the former. Alternatively, a country may be indebted because it has spent large sums of money investing in infrastructure or human capital. In this case, exports, particularly of manufactured goods, would be expected to subsequently increase. Similar arguments can be made for government consumption expenditures. A significant amount of spending may be the result of investment in infrastructure or stimulus for the economy, in which case exports could potentially increase. However, it may also be the case that high government expenditures are a sign of instability or weakness in the economy, which may adversely affect consumer confidence, leading to a decrease in exports. An increase in the money supply, M2, may signify more activity in the economy, in which

case manufacturing and total exports will likely increase, whereas primary exports may decrease as resources are shifted toward more profitable outlets. Conversely, it may be the case that an increase in M2 is the result of economic uncertainty and people may just be holding more money, rather than using it to expand output, in which case there may be a negative relationship with exports. Finally, a low real interest rate may incentivize businesses to open or expand their operations, which may subsequently increase exports, whereas high interest rates discourage investment and business expansion, which in turn may discourage exports, especially of manufactured goods.

4.4.2 Baseline Results

The cross-sectional results are reported in Table 4.1, in which OLS is applied to Equation (13) while omitting the indicators of macroeconomic policy to first give baseline estimates. Notice that the coefficient estimate on investment is positive and highly statistically significant in the total exports equation. Moreover, the magnitude is economically significant, suggesting that increasing the investment to GDP ratio by one percentage point increases total exports by nearly 0.72 percentage points. Perhaps even more striking are the coefficient estimates on the education variable. The coefficient estimate is positive and highly statistically significant in the case of manufacturing exports. The magnitude is also economically large, suggesting that a one percentage point increase in the population that has some secondary education leads to nearly a 0.5 percentage point increase in manufacturing exports as a share of GDP. However, in the primary exports equation, the coefficient estimate is negative and statistically significant with an even larger magnitude. Thus, these results suggest that increasing the secondary education level in a country leads people to utilize their skills in the more productive manufacturing export sector, which in turn diverts resources away from the primary export sector. Last, notice the negative and

statistically significant coefficient estimate on the volatility of the real effective exchange rate (REER) index. This suggests that the volatility of a country's exchange rate is more harmful to the manufacturing export sector than the primary or total export sector. This is somewhat unsurprising since the manufacturing export sector is typically more transaction-intensive than other sectors (Collier & Gunning, 1999).

Table 4.1: Determinants of Exports (Cross-section)

	Total Exp.	Manuf. Exp.	Prim. Exp.
Ann. Avg. GDP per cap. growth rate	0.005	0.049	0.002
	(0.019)	(0.036)	(0.064)
Working-age population growth rate	0.065	-0.271**	-0.006
	(0.071)	(0.112)	(0.201)
Investment	0.718**	0.573	-0.147
	(0.305)	(0.554)	(0.782)
Education	-0.022	0.462*	-0.821**
	(0.155)	(0.241)	(0.388)
Tariff rate	-0.221	-0.111	-0.398
	(0.157)	(0.220)	(0.366)
REER Index Volatility	-0.010	-0.028**	-0.008
	(0.006)	(0.013)	(0.023)
Constant	1.895*	-0.194	5.583**
	(1.080)	(1.889)	(2.757)
R^2	0.207	0.442	0.086
No. of Countries	68	68	68

Note: The dependent variable is the level of exports, averaged over the entire sample period. All explanatory variables are 10-year averages. Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

Table 4.2 presents the results from a fixed effects estimation and provides some support for the cross-sectional results. For example, the coefficient estimate on investment is positive for the total and manufacturing export sectors, although it is only significant in the case of manufacturing exports. The coefficient estimate on investment for the primary exports equation is again negative, albeit insignificant. While the results are qualitatively similar, the only other variable that is statistically significant is the negative coefficient estimate on the tariff rate in the manufacturing exports equation. It implies that increasing the tariff rate by one percentage point

lowers subsequent exports of manufactured goods by nearly 0.17 percentage points.

Taken as a whole, these baseline results imply that investment and education are important for a country that wants to increase its total and manufacturing exports as a share of GDP, in both the short run and long run. However, these measures are ineffective in increasing the level of primary exports. In addition, the benefits of education appear to take time to materialize, as evidenced by its significance in the cross-section and insignificance in the shorter time periods of the panel. The next section addresses the importance of various macroeconomic policy indicators in determining the share of exports in GDP.

Table 4.2: Determinants of Exports (Panel)

	Total Exp.	Manuf. Exp.	Prim. Exp.
Ann. Avg. GDP per cap. growth rate	-0.006	-0.012	-0.012
	(0.005)	(0.009)	(0.009)
Working-age population growth rate	>-0.001	0.013	0.012
	(0.023)	(0.038)	(0.034)
Investment (% of GDP)	0.116	0.503**	-0.210
	(0.082)	(0.225)	(0.226)
Education	0.174	0.143	0.013
	(0.146)	(0.289)	(0.197)
Tariff rate	-0.026	-0.168**	0.016
	(0.025)	(0.077)	(0.070)
REER Index Volatility	>-0.001	-0.003	0.003
	(0.002)	(0.005)	(0.006)
R^2	0.297	0.415	0.061
Observations	219	215	215
No. of Countries	75	74	74

Note: The dependent variable is the 5-year average of the contemporaneous level of exports. All explanatory variables are one-period lags. The constant term and time dummies are omitted for space considerations. Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

4.4.3 Macroeconomic Policy Indicator Results

Table 4.3 contains the results for the cross-sectional case, in which each macroeconomic policy indicator is entered one at a time into the aforementioned equation of

control variables from Table 4.1. Note that more of the policy indicators have a significant effect on manufacturing exports than total or primary exports. For example, consider the real interest rate, whose coefficient estimate is positive and statistically significant in the case of primary exports, but negative and statistically significant in the case of manufacturing exports. An increase in the real interest rate drives up the cost of capital and the manufacturing export sector typically uses capital more intensively than the primary export sector. The results lend support to this idea and the magnitudes imply that a one percentage point increase in the real interest rate decreases manufacturing exports by nearly as much as it increases primary exports. M2 is positively related to manufacturing exports, and is also statistically significant, consistent with the predictions in Section 4.4.1. Moreover, M2 is negatively, albeit insignificantly, related to primary exports, suggesting that an economy which increases its money supply subsequently directs resources away from the primary exports sector.

Table 4.3: Conditional Effects of Policy Indicators on Exports (Cross-section)

	Total Exp.	Manuf. Exp.	Prim. Exp.	# of Countries
Gov. Debt	-0.019 (0.134)	-0.052 (0.139)	-0.045 (0.188)	65
Gov. Consum.	0.220 (0.191)	0.222 (0.356)	-0.384 (0.457)	68
Real Int. Rate	-0.001 (0.005)	-0.024** (0.010)	0.026* (0.013)	64
M2 (% of GDP)	0.030 (0.163)	0.577* (0.330)	-0.530 (0.352)	55
Inflation	-0.060 (0.052)	-0.059 (0.090)	-0.079 (0.111)	68
Inflation Vol.	>-0.001 (0.000)	>-0.001 (0.000)	<0.001 (0.000)	68

Note: Control variables for each policy indicator include annual average GDP growth, labor growth, the investment rate, the percentage of the population with some secondary education, and the tariff rate. For space considerations, the coefficients of these variables, along with the constant, are omitted. Due to sample size restrictions, the policy indicators were entered into the equation one at a time, with no two indicators being included in the same equation. Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

While long-run results are informative, it is also useful to examine the short-run impact of macroeconomic policies on the level of exports. Furthermore, using a panel allows for variation in the observations over time, which in the case of ever-changing macroeconomic policy indicators, may be particularly important for capturing an accurate effect of macroeconomic policy on exports. Table 4.4 contains the results from the fixed effects estimation, in which each macroeconomic policy indicator is again entered one at a time into the equation of control variables from Table 4.2. First, notice that the coefficient estimate on government debt is positive across all sectors and is statistically significant in the case of manufacturing and primary exports. This suggests that a one percentage point increase in a government's debt holdings increases manufacturing and primary exports by 0.18 and 0.32 percentage points, respectively. Interestingly, the coefficient estimate on government consumption is positive and statistically significant for the manufacturing exports sector, suggesting that short-term spending may increase manufactured goods exports, whereas long-term spending (i.e. government debt) is more apt to increase primary exports. Notice, also, that the coefficient on the real interest rate is again positive and statistically significant, which is consistent with the long-term cross-section results, suggesting that an increase in the real interest rate may prompt countries to become more dependent on primary exports. The coefficient estimate on inflation is negative and statistically significant in the primary exports equation, as well as the total exports equation. The magnitudes are also economically significant, suggesting that a one percentage point increase in the inflation rate will decrease total exports by 0.04 percentage points and primary exports by 0.12 percentage points. This is consistent with the observation of Bruno & Easterly (1998) that the statistical significance of inflation becomes more prevalent as data frequency increase. Inflation volatility is also negatively related to total exports and primary exports, but is only significant in the primary exports equation.

Table 4.4: Conditional Effects of Policy Indicators on Exports (Panel)

	Total Exp.	Manuf. Exp.	Prim. Exp.	# of Countries	# of Obs
Gov. Debt	0.013	0.178**	0.318***	68	194
	(0.044)	(0.073)	(0.084)		
Gov. Consum.	0.182	0.482**	-0.147	74	215
	(0.125)	(0.211)	(0.247)		
Real Int. Rate	0.001	0.004	0.006**	70	197
	(0.002)	(0.005)	(0.003)		
M2 (% of GDP)	-0.009	0.085	0.299	73	179
	(0.071)	(0.183)	(0.219)		
Inflation	-0.044**	-0.044	-0.119***	74	210
	(0.018)	(0.035)	(0.035)		
Inflation Vol.	>-0.001	0.001	>-0.001***	74	215
	(0.000)	(0.000)	(0.000)		

Note: Control variables for each policy indicator include annual average GDP growth, labor growth, the investment rate, the percentage of the population with some secondary education, and the tariff rate. For space considerations, the coefficients of these variables, along with the constant, are omitted. Due to sample size restrictions, the policy indicators were entered into the equation one at a time, with no two indicators being included in the same equation. Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

Ideally, all macroeconomic policy indicators would be included in the same regression, as opposed to entering them one at a time. However, doing so drastically reduces the sample size, which in turn jeopardizes the consistency and efficiency of the estimation. These results are presented below, but caution is warranted when trying to interpret the results.

4.4.4 IV-GMM Estimation Results

As discussed previously, the literature shows that exports and macroeconomic policy each directly affect growth. However, as demonstrated thus far, macroeconomic policy also directly affects the level of exports, implying that macroeconomic policy may affect economic growth indirectly through its impact on exports. One way to explore this issue is through the use of simultaneous equations methods. While two-stage least squares (2SLS) is a popular estimator it can be shown that IV-GMM, which is

Table 4.5: Complete Results (Cross-Section)

	Total Exp.	Manuf. Exp.	Prim. Exp.
Controls:			
Ann. Avg. GDP per cap. growth rate	-0.010	0.006	0.053
	(0.029)	(0.038)	(0.062)
Working-age pop. growth rate	0.048	-0.126	-0.280
	(0.090)	(0.171)	(0.195)
Investment	0.946**	0.125	1.069
	(0.425)	(0.658)	(0.947)
Education	-0.162	0.496	-1.505***
	(0.185)	(0.392)	(0.411)
Tariff Rate	-0.237	-0.118	-0.578
	(0.208)	(0.323)	(0.413)
REER Index Volatility	-0.009	-0.016	-0.062**
	(0.009)	(0.025)	(0.027)
Macroeconomic Policy Indicators:			
Government Debt	0.111	-0.135	0.137
	(0.136)	(0.174)	(0.288)
Government Consumption	0.194	0.324	-0.430
	(0.379)	(0.579)	(0.753)
Real Interest Rate	0.003	-0.022**	0.037*
	(0.006)	(0.011)	(0.019)
M2	-0.038	0.524	-0.851**
	(0.219)	(0.361)	(0.404)
Inflation	-0.009	0.167	-0.079
	(0.089)	(0.106)	(0.136)
Inflation Volatility	>-0.001	-0.001	0.001
	(0.000)	(0.000)	(0.001)
Constant	0.961	-1.818	9.393*
	(2.015)	(3.557)	(4.820)
R^2	0.250	0.515	0.445
No. of Countries	48	48	48

Note: Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1. Summary statistics for these variables are in Table C.4.

also a two-step method, provides more efficient estimates than 2SLS when the model is over-identified, as is the case here. Thus, IV-GMM is the preferred estimation technique in this context.

Table 4.7 presents the results from employing this IV-GMM technique for the cross-section and panel dataset without the macroeconomic policy indicators included.

Table 4.6: Complete Results (Panel)

	Total Exp.	Manuf. Exp.	Prim. Exp.
Controls:			
Ann. Avg. GDP per cap. growth rate	-0.011*	-0.002	-0.021
	(0.007)	(0.011)	(0.013)
Working-age pop. growth rate	0.018	0.092	0.158***
	(0.033)	(0.059)	(0.056)
Investment	0.166	0.822***	-0.083
	(0.114)	(0.301)	(0.274)
Education	0.144	0.169	0.016
	(0.087)	(0.217)	(0.186)
Tariff rate	-0.063	-0.359***	-0.009
	(0.046)	(0.089)	(0.102)
REER Index Volatility	-0.002	-0.001	0.004
	(0.003)	(0.006)	(0.007)
Macroeconomic Policy Indicators:			
Government Debt	-0.023	0.097	0.315***
	(0.045)	(0.089)	(0.116)
Government Consumption	0.127	0.619*	-0.549
	(0.149)	(0.318)	(0.465)
Real Interest Rate	-0.002	-0.001	<0.001
	(0.003)	(0.004)	(0.004)
M2	-0.071	0.001	0.291
	(0.066)	(0.195)	(0.227)
Inflation	-0.126***	-0.199***	-0.171***
	(0.030)	(0.060)	(0.062)
Inflation Volatility	0.001***	0.003***	<0.001
	(0.000)	(0.001)	(0.001)
R^2	0.808	0.741	0.845
No. of countries	61	61	61
No. of Obs.	141	140	140

Note: Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1. Summary statistics for these variables are in Table C.5.

The first column presents the results from the cross-section regression, in which manufacturing exports and labor force growth are positively and statistically significantly related to economic growth. While the coefficient estimate on initial GDP per capita is of the correct expected sign, it is statistically insignificant. The coefficient estimates on investment and education are insignificant as well, but are also of the opposite expected sign. Notice that when using panel data in column two that manufacturing

Table 4.7: IV-GMM Growth Equation Results

Endogenous:	Manuf. Exp. and Prim. Exp.	
Excluded Exogenous:	Tariff Rate, REER Index Volatility, Ann. Avg. GDP per cap. growth	
	Cross-section	Panel
Manuf. Exp.	1.103*	0.357
	(0.567)	(0.312)
Primary Exp.	-0.362	0.443*
	(0.367)	(0.260)
Initial GDP per cap.	-0.246	-0.203
	(0.212)	(0.180)
Working-age pop. growth	0.273*	-0.036
	(0.147)	(0.025)
Investment	-0.630	-0.156
	(0.745)	(0.254)
Education	-0.491	0.091
	(0.360)	(0.153)
Hansen J	3.409	0.000
Hansen p-value	0.065	0.994
No. of Countries	67	66
Observations		206

Note: The dependent variable is GDP per capita growth over the period 1990-2009. All explanatory variables are 10-year averages, except manufacturing and primary exports, which are predicted values from the first-stage regressions. First-stage results are omitted. Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

exports and labor force growth are statistically insignificant, and labor force growth even has the opposite sign from column one. Furthermore, the only statistically significant variable in column two is primary exports and it has a positive sign, which seems somewhat surprising given that primary exports are generally thought to be negatively correlated with economic growth. However, a reasonable explanation is that since the panel allows for variation over time, it may be the case that primary exports simply have more variation than variables such as investment and education.[41] As such, it may be that even if the other variables are collectively driving economic growth, there may not be enough variation for this to show up statistically so that the effect that is being captured may be the result of a country simply have higher

[41]Summary statistics listed in the Appendix confirm this.

growth at a time when primary exports are also relatively higher, even if they are not actually the driver of the growth. However, caution is warranted when interpreting the results, as the Hansen J test suggests the instruments may not be valid in the cross-section case.

Table 4.8: IV-GMM Conditional Effects of Policy Indicators on GDP per cap. growth (Cross-section)

Endogenous:	Manuf. Exp. and Prim. Exp.			
Excluded Exogenous:	Tariff Rate, REER Index Volatility, Ann. Avg. GDP per cap. growth			
	Coeff.	Obs.	Hansen J	Hansen p-value
Government Debt	-0.029 (0.112)	64	7.571	0.006
Government Consumption	-0.390 (0.375)	67	3.109	0.078
Real Interest Rate	0.046 (0.028)	63	0.547	0.459
M2	1.939 (3.596)	54	0.175	0.676
Inflation	0.014 (0.127)	67	2.847	0.092
Inflation Volatility	<0.001 (0.000)	67	3.450	0.063

Note: The variables from Table 4.7 are included as controls. For space considerations, the coefficients of these variables, along with the constant terms, are omitted. Due to sample size restrictions, the policy indicators were entered into the equation one at a time, with no two policy indicators being included in the same equation. First-stage results are omitted. Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

Macroeconomic policy indicators are entered sequentially in Tables 4.8 and 4.9, but none of the policies are statistically significantly related to economic growth. One plausible explanation for this is that the macroeconomic policy indicators considered simply do not directly affect growth. Thus, beyond their impact on exports, macroeconomic policy does not matter for economic growth. Caution is warranted when interpreting these results, though, as the Hansen J Statistic yields mixed results as to the orthogonality of the over-identifying restrictions. This could indicate poor

Table 4.9: IV-GMM Conditional Effects of Policy Indicators on GDP per cap. growth (Panel)

Endogenous:	Manuf. Exp. and Prim. Exp.				
Excluded Exogenous:	Tariff Rate, REER Index Volatility, Ann. Avg. GDP per cap. growth				
	Coeff.	Countries	Obs.	Hansen J	Hansen p-value
Government Debt	-0.159 (0.131)	61	186	0.010	0.919
Government Consumption	0.029 (0.172)	66	206	0.000	0.992
Real Interest Rate	>-0.001 (0.004)	60	186	0.001	0.977
M2	-0.142 (0.154)	54	159	0.015	0.903
Inflation	0.019 (0.021)	66	202	0.008	0.930
Inflation Volatility	0.001 (0.001)	66	206	0.001	0.978

Note: The variables from Table 4.7 are included as controls. For space considerations, the coefficients of these variables are omitted. Due to sample size restrictions, the policy indicators were entered into the equation one at a time, with no two indicators being included in the same equation. First-stage results are omitted. Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

instruments and/or a misspecified model.

4.4.5 High Manufacturing Exports vs. Low Manufacturing Exports

Previous studies have shown that certain policy changes may affect capital- and transaction-intensive industries, such as those that export manufactures, more so than those that export less capital- and transaction-intensive goods, such as primary products (Collier & Gunning, 1999). In this section, I explore the possibility that countries with different export profiles may react differently to changing macroeconomic conditions by creating a dummy variable equal to one if the manufacturing exports of a country are in the top 25^{th} percentile. I then create an interaction term between this dummy variable and each macroeconomic policy variable and repeat the previous exercises from the paper.

Table 4.10: Conditional Effects of Policy Indicators on Exports (Cross-section)

	Total Exp.	Manuf. Exp.	Prim. Exp.	# of Countries
High-Manufacturing Export Countries:				
Government Debt	-0.114	-0.008	0.144	65
	(0.153)	(0.089)	(0.230)	
Government Consum.	0.188	-0.397	0.273	68
	(0.354)	(0.340)	(0.576)	
Real Interest Rate	-0.011	-0.033*	-0.018	64
	(0.015)	(0.018)	(0.035)	
M2 (% of GDP)	0.081	0.255	-0.323	55
	(0.171)	(0.244)	(0.390)	
Inflation	-0.084	0.037	-0.237*	68
	(0.066)	(0.085)	(0.132)	
Inflation Volatility	<0.001	<0.001	<0.001	68
	(0.000)	(0.000)	(0.001)	
Low-Manufacturing Export Countries:				
Government Debt	0.103	-0.039	-0.265	65
	(0.160)	(0.162)	(0.304)	
Government Consum.	0.102	-0.008	-0.618	68
	(0.216)	(0.413)	(0.630)	
Real Interest Rate	0.007	-0.003	0.032**	64
	(0.006)	(0.011)	(0.016)	
M2 (% of GDP)	-0.053	0.375	-0.497	55
	(0.197)	(0.256)	(0.429)	
Inflation	-0.040	-0.045	-0.034	68
	(0.064)	(0.076)	(0.114)	
Inflation Volatility	>-0.001*	>-0.001	<0.001	68
	(0.000)	(0.000)	(0.000)	

Note: The variables from Table 4.7 are included as controls. For space considerations, the coefficients of these variables, along with the constant, are omitted. Due to sample size restrictions, the policy indicators were entered into the equation one at a time, with no two indicators being included in the same equation. Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

The cross-sectional results are presented in Table 4.10. First, notice the negative and statistically significant coefficient estimate on the real interest rate in the second column for the case of countries with a high level of manufacturing exports. This implies that a one percentage point increase in the real interest rate drives down manufacturing exports 3.3%. Countries with a high content of manufactured goods also see a negative correlation between inflation and primary exports. Specifically,

increasing inflation ten percent is associated with a decrease in primary exports of 2.4%. In countries with relatively less manufacturing exports, notice that an increase in the real interest rate is associated with an increase in primary exports, perhaps due to a shift toward less capital-intensive exports.

Table 4.11: Conditional Effects of Policy Indicators on Exports (Panel)

	Total Exp.	Manuf. Exp.	Prim. Exp.	# of Countries	# of Obs
High-manufacturing export countries:					
Gov. Debt	0.070	0.204**	0.375***	68	194
	(0.066)	(0.100)	(0.123)		
Gov. Consum.	0.206	0.379	0.009	74	215
	(0.196)	(0.251)	(0.272)		
Real Int. Rate	0.003	0.014***	0.003	70	197
	(0.004)	(0.005)	(0.007)		
M2 (% of GDP)	0.094	0.048	0.201	73	179
	(0.096)	(0.119)	(0.132)		
Inflation	-0.059**	-0.068	-0.077**	74	210
	(0.026)	(0.043)	(0.029)		
Inflation Vol.	>-0.001	<0.001	-0.001***	74	215
	(0.000)	(0.000)	(0.000)		
Low-manufacturing export countries:					
Gov. Debt	-0.020	0.156*	0.216*	68	194
	(0.058)	(0.088)	(0.110)		
Gov. Consum.	0.296**	0.543**	-0.321	74	215
	(0.130)	(0.251)	(0.301)		
Real Int. Rate	-0.001	0.003	0.007**	70	197
	(0.003)	(0.005)	(0.003)		
M2 (% of GDP)	0.155	0.114	0.113	73	179
	(0.094)	(0.202)	(0.197)		
Inflation	-0.100***	0.002	-0.053	74	210
	(0.032)	(0.060)	(0.051)		
Inflation Vol.	-0.003	0.006	-0.003	74	215
	(0.003)	(0.004)	(0.007)		

Note: The variables from Table 4.7 are included as controls. For space considerations, the coefficients of these variables, along with the constant, are omitted. Due to sample size restrictions, the policy indicators were entered into the equation one at a time, with no two indicators being included in the same equation. Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

When turning to panel data in Table 4.11, notice there are many striking results. Beginning first with the high-manufacturing-exports countries, it is interesting that

Table 4.12: IV-GMM Conditional Effects of Policy Indicators on GDP per cap. growth (Cross-section)

Endogenous:	Manuf. Exp. and Prim. Exp.				
Excluded Exogenous:	Tariff Rate, REER Index Volatility, Ann. Avg. GDP per cap. growth				
	High-Mfg	Low-Mfg	Obs.	Hansen J	Hansen p-value
Gov. Debt	0.007	0.026	64	5.788	0.016
	(0.092)	(0.082)			
Gov. Cons.	-0.055	-0.140	67	5.448	0.020
	(0.192)	(0.139)			
Real Int. Rate	0.035**	-0.008	63	6.011	0.014
	(0.198)	(0.006)			
M2	0.133	0.198	54	8.649	0.003
	(0.198)	(0.210)			
Inflation	-0.014	0.028	67	7.247	0.007
	(0.064)	(0.041)			
Inflation Vol.	-0.001***	>-0.001	67	4.310	0.038
	(0.000)	(0.000)			

Note: The variables from Table 4.7 are included as controls. For space considerations, the coefficients of these variables, along with the constant terms, are omitted. Due to sample size restrictions, the policy indicators were entered into the equation one at a time, with no two policy indicators being included in the same equation. First-stage results are omitted. Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

an increase in government debt is associated with both an increase in manufacturing exports and an increase in primary exports. Inflation and inflation volatility are negatively correlated with exports across the board, but particularly with primary exports, as in Table 4.10. Surprisingly, the coefficient estimate on the real interest rate implies that an increase in the real interest rate actually increases manufacturing exports.

Now, looking at the results for low-manufacturing-export countries, note that an increase in government debt is still positively correlated with both manufacturing and primary exports. Inflation is also still negatively related to exports, but is only statistically significant in the case of total exports. As in Table 4.10, the statistically significant coefficient estimate on the real interest rate in the primary exports equation suggests that countries move toward less capital-intensive products as the

Table 4.13: IV-GMM Conditional Effects of Policy Indicators on GDP per cap. growth (Panel)

Endogenous:	Manuf. Exp. and Prim. Exp.					
Excluded Exogenous:	Tariff Rate, REER Index Volatility, Ann. Avg. GDP per cap. growth					
	High-Mfg	Low-Mfg	Countries	Obs.	Hansen J	Hansen p-value
Gov. Debt	-0.306 (0.191)	-0.148 (0.168)	61	186	0.103	0.748
Gov. Cons.	-0.136 (0.263)	-0.068 (0.345)	66	206	0.000	0.990
Real Int. Rate	-0.001 (0.011)	-0.003 (0.006)	60	186	0.167	0.682
M2	-0.115 (0.173)	-0.059 (0.222)	54	159	0.036	0.849
Inflation	0.033 (0.029)	-0.008 (0.032)	66	202	0.000	0.997
Inflation Vol.	0.001 (0.001)	0.003 (0.006)	66	206	0.000	0.997

Note: The variables from Table 4.7 are included as controls. For space considerations, the coefficients of these variables, along with the constant terms, are omitted. Due to sample size restrictions, the policy indicators were entered into the equation one at a time, with no two policy indicators being included in the same equation. First-stage results are omitted. Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

interest rate rises. Government consumption expenditure remains positive, as with the high-manufacturing-export countries, but in this case the coefficient estimates are statistically significant. This suggests that a one percent increase in government spending leads to 0.3% more total exports and over 0.5% more manufacturing exports.

Thus, it appears that macroeconomic policy does exert an influence on exports and that this influence is slightly different for countries with different export profiles. In Table 4.12, there is some evidence that macroeconomic policy matters more for economic growth in countries with a high content of manufacturing exports, although the results are somewhat puzzling. It seems as though an increase in the real interest rate is associated with an increase in economic growth over the 20-year period under consideration. Inflation volatility, however, is negatively related to economic growth, suggesting that inflation stability may increase growth in high-manufacturing-export countries. Turning to Table 4.13, notice that none of the macroeconomic policy

variables are statistically significant, consistent with the earlier panel results. Overall, the results from Tables 4.12 and 4.13 suggest that, at best, macroeconomic policy only has an influence on economic growth over a long time period and for countries with a relatively high content of manufacturing exports, such as more industrialized countries. However, caution is again warranted, as the Hansen J test suggests the instruments are invalid in the cross-section context.

4.5 Concluding Remarks

This paper takes a relatively broad perspective in characterizing the relationship between exports, macroeconomic policy, and economic growth. There appears to be some evidence in favor of macroeconomic policy exerting a direct impact on the level of a country's exports, but evidence supporting a direct link between macroeconomic policy and growth is sparse. The results show that macroeconomic policy is more strongly correlated with the level of exports when using panel data, rather than with cross-sectional data. This suggests that the variation in macroeconomic policy over time may matter more for exports and, additionally, that these effects tend to dissipate in the long run. When the two-step estimation is employed, the results show a positive relationship between manufacturing exports and growth, confirming conventional wisdom that countries that emphasize manufacturing exports experience higher economic growth, on average.

Overall, macroeconomic policy appears to play a limited role in terms of its impact on economic growth and the level of exports within a country. However, caution is warranted when making inferences from these results, as country coverage is relatively constricted and the data quality for the macroeconomic policy indicators of interest are imperfect. Looking forward, a more comprehensive dataset, with more direct measures of macroeconomic policy would greatly benefit this study.

Appendix: Essay 1

Table A.1: Panel Summary Statistics

	No.	Mean	Std. Dev.	Min.	Max.
Full					
GROWTH	756	7.72	12.65	-69.32	50.43
INIT_GDP	756	5152.71	3.56	169.10	71160.49
EDUC	756	24.05	2.45	0.50	86.44
INV	756	21.15	1.35	4.74	53.00
POPGR	756	1.68	1.12	-1.76	6.39
$MNFG_{lag}$	756	4.55	4.23	0.08	134.38
$PRIM_{lag}$	756	5.60	2.53	0.31	65.67
Low-income					
GROWTH	378	6.90	14.53	-69.32	50.43
INIT_GDP	378	1742.51	2.03	169.10	5379.46
EDUC	378	14.94	2.65	0.50	79.53
INV	378	19.77	1.42	4.74	53.00
POPGR	378	2.30	0.95	-1.76	6.39
$MNFG_{lag}$	378	2.18	3.69	0.08	49.22
$PRIM_{lag}$	378	7.23	2.51	0.78	65.67
High-income					
GROWTH	378	8.54	10.40	-25.65	48.96
INIT_GDP	378	15236.92	1.84	5382.73	71160.49
EDUC	378	38.72	1.58	7.44	86.44
INV	378	22.62	1.24	10.08	47.38
POPGR	378	1.05	0.90	-0.93	4.17
$MNFG_{lag}$	378	9.50	3.24	0.22	134.38
$PRIM_{lag}$	378	4.33	2.38	0.31	44.54

Note: The sample split is based on the median value of initial GDP per capita, which is approximately $5,381.

Table A.2: Cross-section Summary Statistics

	No.	Mean	Std. Dev.	Min.	Max.
Full					
GROWTH	86	66.82	50.27	-52.36	211.53
INIT_GDP_{70}	86	3547.20	3.07	351.41	25963.03
EDUC_{70}	86	12.42	2.99	0.50	73.42
INV_{7079}	86	21.44	1.41	7.25	40.33
POPGR_{7079}	86	1.93	1.09	-0.36	4.88
MNFG_{7079}	86	2.96	3.93	0.09	61.64
PRIM_{7079}	86	6.66	2.53	0.52	32.09
Low-income					
GROWTH	43	58.44	58.53	-52.36	211.53
INIT_GDP_{70}	43	1335.51	1.65	351.41	3018.41
EDUC_{70}	43	6.65	3.01	0.50	49.99
INV_{7079}	43	18.67	1.48	7.25	35.35
POPGR_{7079}	43	2.52	0.94	-0.36	4.88
MNFG_{7079}	43	1.43	3.10	0.09	16.54
PRIM_{7079}	43	8.46	2.42	1.36	32.09
High-income					
GROWTH	43	75.20	39.31	-51.55	193.99
INIT_GDP_{70}	43	9421.65	1.80	3064.73	25963.03
EDUC_{70}	43	23.20	1.90	5.48	73.42
INV_{7079}	43	24.63	1.23	16.64	40.33
POPGR_{7079}	43	1.34	0.90	0.05	3.10
MNFG_{7079}	43	6.15	3.29	0.25	61.64
PRIM_{7079}	43	5.24	2.51	0.52	30.18

Note: The sample split is based on the median value of initial GDP per capita, which is approximately $\$3,041$.

Table A.3: Variable Definitions

Variable	Definition
GROWTH	Growth of GDP per capita, calculated as the log difference between the beginning (1970) and end of the period (2009)[a]
INIT_GDP_{70}	1970 GDP per capita (PPP, 2005 international \$)[a]
EDUC_{70}	Percentage of secondary schooling attained in 1970 by the population aged 15 years and older[b]
INV_{7079}	Investment as a share of GDP, averaged over the period 1970-79; consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories
POPGR_{7079}	Average annual population growth rate over the period 1970-79
MNFG_{7079}	Manufacturing exports as a share of GDP, averaged over the period 1970-79; Manufactures comprise commodities in SITC sections 5 (chemicals), 6 (basic manufactures), 7 (machinery and transport equipment), and 8 (miscellaneous manufactured goods), excluding division 68 (non-ferrous metals)
PRIM_{7079}	Agricultural and food exports as a share of GDP, averaged over the period 1970-79; agricultural exports comprise SITC section 2 (crude materials except fuels) excluding divisions 22, 27 (crude fertilizers and minerals excluding coal, petroleum, and precious stones), and 28 metalliferous ores and scrap); Food exports comprise the commodities in SITC sections 0 (food and live animals), 1 (beverages and tobacco), and 4 (animal and vegetable oils and fats) and SITC division 22 (oil seeds, oil nuts, and oil kernels)
TOT_EXP_{7079}	Total merchandise exports, as a percentage of GDP, averaged over the period 1970-79

Note: All explanatory variables are in logs. Data are from the World Development Indicators 2010 Database, with the exception of:
[a] Data are from Penn World Tables, version 7.0 Heston *et al.* (2011).
[b] Data are from Barro & Lee (2010).

Table A.4: Disaggregated Exports - Countries (by Terminal Node)

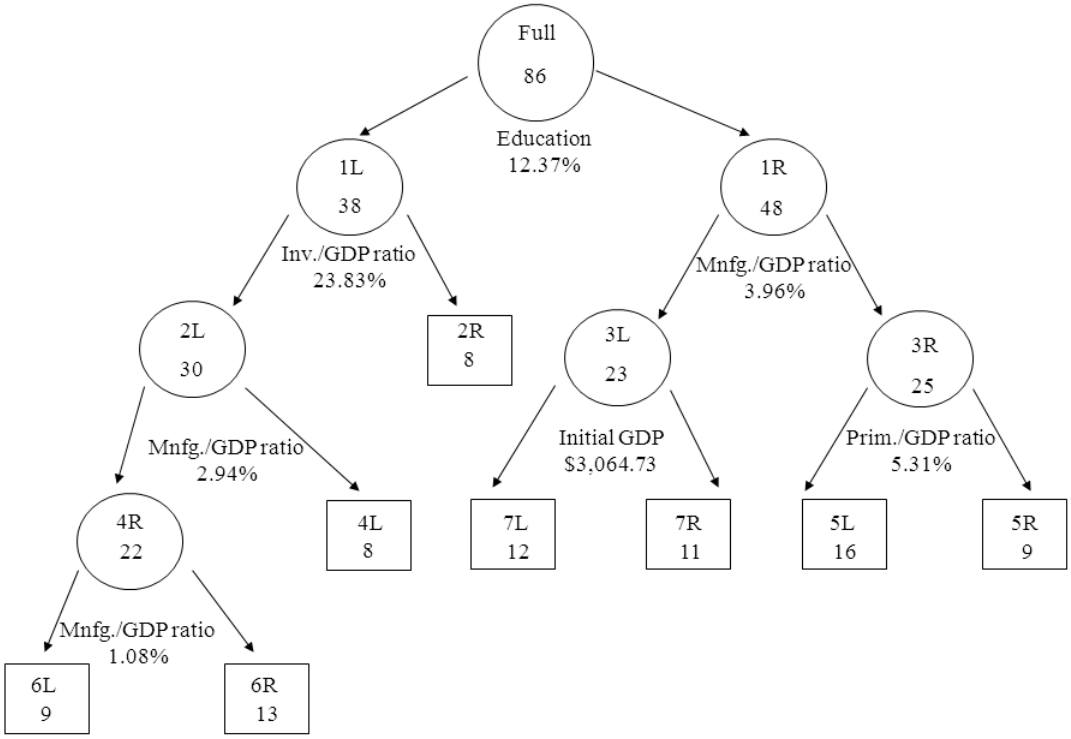
1L		1R	
Afghanistan	Mauritania	Argentina	Israel
Bangladesh	Mexico	Australia	Italy
Benin	Morocco	Austria	Japan
Burundi	Nepal	Barbados	Jordan
Cameroon	Nicaragua	Bolivia	Korea, Rep. of
Central African Republic	Niger	Brazil	Malaysia
Congo, Republic of	Pakistan	Cambodia	Malta
Costa Rica	Papua New Guinea	Canada	Mauritius
Cote d'Ivoire	Portugal	Chile	Netherlands
Egypt	Senegal	Colombia	New Zealand
El Salvador	Spain	Cuba	Norway
Gambia, The	Sudan	Denmark	Paraguay
Guatemala	Syria	Dom. Republic	Peru
Honduras	Thailand	Fiji	Philippines
India	Togo	Finland	Singapore
Jamaica	Tunisia	France	South Africa
Kenya	Turkey	Germany	Sri Lanka
Malawi	Uganda	Ghana	Sweden
Mali	Zambia	Greece	Switzerland
		Guyana	Tonga
		Hong Kong	Trinidad & Tobago
		Hungary	United Kingdom
		Iceland	United States
		Ireland	Uruguay

Table A.5: Regression Tree Summary Statistics

	No.	Mean	Std. Dev.	Min.	Max.
Full					
GROWTH	86	66.82	50.27	-52.36	211.53
$INIT\_GDP_{70}$	86	3547.20	3.07	351.41	25963.03
$EDUC_{70}$	86	12.42	2.99	0.50	73.42
INV_{7079}	86	21.44	1.41	7.25	40.33
$POPGR_{7079}$	86	1.93	1.09	-0.36	4.88
$MNFG_{7079}$	86	2.96	3.93	0.09	61.64
$PRIM_{7079}$	86	6.66	2.53	0.52	31.09
1L					
GROWTH	38	43.21	50.32	-52.36	159.85
$INIT\_GDP_{70}$	38	1635.41	2.29	351.41	11980.73
$EDUC_{70}$	38	4.55	2.24	0.50	12.37
INV_{7079}	38	18.20	1.45	7.25	29.40
$POPGR_{7079}$	38	2.65	0.77	0.74	4.88
$MNFG_{7079}$	38	1.77	3.00	0.10	13.70
$PRIM_{7079}$	38	7.33	2.36	1.36	32.09
1R					
GROWTH	48	85.51	42.07	27.75	211.53
$INIT\_GDP_{70}$	48	6547.75	2.54	938.89	25963.03
$EDUC_{70}$	48	27.53	1.56	12.40	73.42
INV_{7079}	48	24.42	1.29	9.68	40.33
$POPGR_{7079}$	48	1.35	0.96	-0.36	3.74
$MNFG_{7079}$	48	4.45	4.19	0.09	61.64
$PRIM_{7079}$	48	6.17	2.67	0.52	30.78

Note: The sample split is chosen by the regression tree technique to be approximately the average percent of the population with some secondary education, or 12.37%.

Figure A.1: Full Regression Tree (No pruning)



Notes: Square nodes denote terminal nodes; the number inside each is the number of observations/countries in that node. Underneath each non-terminal (circular) node is the level of the variable chosen for that split; nodes to the left contain observations that are less than or equal to the given value. Nodes are numbered in reverse order of when they were selected by the procedure to be pruned (e.g. nodes 7L and 7R were pruned first, nodes 6L and 6R were pruned next, and so on).

Appendix: Essay 2

The following fiscal episode definitions are from Alesina & Ardagna (2009)[42]:

Fiscal Consolidation (Stimuli): A period of fiscal consolidation (stimulus) is a year in which the cyclically adjusted primary balance improves (deteriorates) by at least 1.5 percent of GDP.

Successful fiscal consolidation: A period of fiscal consolidation is successful if the cumulative reduction of the debt to GDP ratio three years after the beginning of a fiscal consolidation is greater than 4.5 percentage points (the value of 25^{th} percentile of the change of the debt-to-GDP ratio empirical density in all episodes of fiscal consolidations).

The countries include: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Greece, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and United States.
Leigh *et al.* (2010) 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.[43] The countries in their study include: Australia, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Portugal, Spain, Sweden, the United Kingdom, and the United States.
Variable definitions are listed below. Trade data are collected from the World Integrated Trade Solutions database (4-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 5-year averages.

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

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

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

Distance: Log of the distance between h and i.

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.

[42]See Alesina & Ardagna (2009), pgs. 8-10, for a detailed exposition as to why these specific definitions are chosen.
[43]For more information, see Leigh *et al.* (2010), page 97.

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.

Table B.1: Summary Statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
Extensive Margin	14,441	360.39	2.03	6.00	1478.00
Intensive Margin	14,441	16.02	4.42	0.10	1947.83
Total Exports	14,441	5,775.10	7.63	1.40	1,433,600.97
Exp. Fis. Stim.$_t$	14,441	0.11	0.31	0.00	1.00
Exp. Fis. Cons.$_t$	14,441	0.13	0.34	0.00	1.00
Exp. Fis. Stim.$_{t+1}$	14,441	0.09	0.28	0.00	1.00
Exp. Fis. Cons.$_{t+1}$	14,441	0.10	0.30	0.00	1.00
Exp. Fis. Stim.$_{t+2}$	14,441	0.09	0.28	0.00	1.00
Exp. Fis. Cons.$_{t+2}$	14,441	0.10	0.30	0.00	1.00
Exp. Fis. Stim.$_{t+3}$	14,441	0.09	0.28	0.00	1.00
Exp. Fis. Cons.$_{t+3}$	14,441	0.10	0.30	0.00	1.00
Imp. Fis. Stim.$_t$	14,441	0.11	0.32	0.00	1.00
Imp. Fis. Cons.$_t$	14,441	0.13	0.34	0.00	1.00
Imp. Fis. Stim.$_{t+1}$	14,441	0.09	0.28	0.00	1.00
Imp. Fis. Cons.$_{t+1}$	14,441	0.10	0.30	0.00	1.00
Imp. Fis. Stim.$_{t+2}$	14,441	0.09	0.28	0.00	1.00
Imp. Fis. Cons.$_{t+2}$	14,441	0.10	0.30	0.00	1.00
Imp. Fis. Stim.$_{t+3}$	14,441	0.09	0.28	0.00	1.00
Imp. Fis. Cons.$_{t+3}$	14,441	0.10	0.30	0.00	1.00
Distance	14,441	2,079.33	3.12	137.23	12,294.42
Population$_h$	14,441	18,402,186.00	3.51	2,820,007.00	309,051,967.00
Population$_i$	14,441	18,349,998.00	3.50	2,820,007.00	309,051,967.00
Real GDP per cap.$_h$	14,441	12,360.57	160.36	2,372.72	44,212.03
Real GDP per cap.$_i$	14,441	12,357.09	160.41	2,372.72	44,212.03
Strict Currency Union	14,441	0.09	0.29	0.00	1.00
Common Language	14,441	0.14	0.35	0.00	1.00
Reg. Trade Agreement	14,441	0.39	0.49	0.00	1.00
Common Border	14,441	0.08	0.27	0.00	1.00
Number of Islands	14,441	0.31	0.50	0.00	2.00
Log Prod. of Land Area	14,441	25.50	2.23	20.96	32.20
Colony	14,441	0.04	0.20	0.00	1.00

Table B.2: Summary Statistics for IMF data

Variable	Obs	Mean	Std.Dev.	Min	Max
Extensive Margin	5,965	480.47	1.56	36.00	1,478.00
Intensive Margin	5,965	27.77	4.06	0.23	1,947.83
Total Exports	5,965	13,341.32	5.74	13.25	1,433,600.97
Exp. Cons.$_t$	5,965	0.07	0.26	0.00	1.00
Exp. Cons.$_{t+1}$	5,965	0.04	0.21	0.00	1.00
Exp. Cons.$_{t+2}$	5,965	0.04	0.20	0.00	1.00
Exp. Cons.$_{t+3}$	5,965	0.04	0.20	0.00	1.00
Imp. Cons.$_t$	5,965	0.07	0.26	0.00	1.00
Imp. Cons.$_{t+1}$	5,965	0.04	0.20	0.00	1.00
Imp. Cons.$_{t+2}$	5,965	0.04	0.20	0.00	1.00
Imp. Cons.$_{t+3}$	5,965	0.04	0.20	0.00	1.00
Distance	5,965	2,085.46	2.86	214.97	10,032.20
Population$_h$	5,965	26,228,836.68	3.53	3,400,999.78	309,051,967.40
Population$_i$	5,965	26,169,103.05	3.52	3,400,999.78	309,051,967.40
Real GDP per cap.$_h$	5,965	138.97	1.50	23.95	288.70
Real GDP per cap.$_i$	5,965	138.74	1.51	23.95	288.70
Strict Currency Union	5,965	0.11	0.32	0.00	1.00
Common Language	5,965	0.18	0.39	0.00	1.00
Reg. Trade Agreement	5,965	0.42	0.49	0.00	1.00
Common Border	5,965	0.09	0.29	0.00	1.00
Number of Islands	5,965	0.28	0.47	0.00	2.00
Log Prod. of Land Area	5,965	26.14	2.33	21.00	32.20
Colony	5,965	0.04	0.20	0.00	1.00

Table B.3: Conditional Effects of Fiscal Episodes on Total Exports

	t	t+1	t+2	t+3	Total
Exp. Cons.	<0.001	0.041***	0.025**	-0.004	0.062*
	(0.010)	(0.011)	(0.011)	(0.011)	(0.037)
Exp. Stim.	-0.076***	-0.052***	-0.054***	-0.056***	-0.238***
	(0.012)	(0.012)	(0.013)	(0.012)	(0.044)
Imp. Cons.	-0.026**	-0.014	-0.016	-0.016	-0.072*
	(0.012)	(0.013)	(0.012)	(0.012)	(0.043)
Imp. Stim.	-0.029**	-0.019	-0.016	-0.005	-0.070
	(0.014)	(0.014)	(0.014)	(0.013)	(0.050)
R^2	0.919				
Observations	14,441				
Year Effects	Yes				
Exp. and Imp. Effects	No				
Country-pair Effects	Yes				

Note: These are the estimated marginal effects when the indicated fiscal episode occurs in period t. The results are from a single regression, but are presented in multiple columns for readability. In addition, the control variables from Table 3.2 are included in the regression, but the coefficient estimates are omitted here for space considerations. Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

Table B.4: Marginal Effects of Fiscal Episodes Occurring Simultaneously in Each Country (Total Exports)

	t	t+1	t+2	t+3	Total
Exp. and Imp. Cons.	-0.025	0.027	0.009	-0.020	-0.009
	(0.016)	(0.018)	(0.018)	(0.017)	(0.061)
Exp. and Imp. Stim.	-0.105***	-0.071***	-0.070***	-0.061***	-0.308***
	(0.018)	(0.019)	(0.019)	(0.018)	(0.067)
Exp. Cons. and Imp. Stim.	-0.029	0.022	0.008	-0.009	-0.008
	(0.018)	(0.018)	(0.018)	(0.017)	(0.063)
Exp. Stim. and Imp. Cons.	-0.102***	-0.067***	-0.069***	-0.072***	-0.310***
	(0.017)	(0.018)	(0.017)	(0.017)	(0.061)

Note: Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

Table B.5: Conditional Effects of Fiscal Episodes on the Extensive Margin

	t	t+1	t+2	t+3	Total
Exp. Cons.	0.011*	0.049***	0.052***	0.035***	0.147***
	(0.006)	(0.005)	(0.006)	(0.005)	(0.018)
Exp. Stim.	-0.045***	-0.041***	-0.025***	-0.022***	-0.134***
	(0.006)	(0.006)	(0.005)	(0.006)	(0.021)
Imp. Cons.	0.004	0.008	0.007	0.008	0.027
	(0.006)	(0.007)	(0.007)	(0.007)	(0.023)
Imp. Stim.	-0.010	-0.004	-0.001	0.002	-0.012
	(0.007)	(0.007)	(0.007)	(0.007)	(0.025)
R^2	0.833				
Observations	14,441				
Year Effects	Yes				
Exp. and Imp. Effects	No				
Country-pair Effects	Yes				

Note: These are the estimated marginal effects when the indicated fiscal episode occurs in period t. The results are from a single regression, but are presented in multiple columns for readability. In addition, the control variables from Table 3.2 are included in the regression, but the coefficient estimates are omitted here for space considerations. Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

Table B.6: Marginal Effects of Fiscal Episodes Occurring Simultaneously in Each Country (Extensive Margin)

	t	t+1	t+2	t+3	Total
Exp. and Imp. Cons.	0.015*	0.057***	0.059***	0.043***	0.174***
	(0.008)	(0.009)	(0.010)	(0.009)	(0.032)
Exp. and Imp. Stim.	-0.055***	-0.045***	-0.025***	-0.020**	-0.146***
	(0.010)	(0.009)	(0.009)	(0.010)	(0.034)
Exp. Cons. and Imp. Stim.	0.001	0.045***	0.051***	0.038***	0.135***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.031)
Exp. Stim. and Imp. Cons.	-0.041***	-0.033***	-0.018*	-0.015	-0.107***
	(0.009)	(0.009)	(0.009)	(0.010)	(0.034)

Note: Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

Table B.7: Conditional Effects of Fiscal Episodes on the Intensive Margin

	t	t+1	t+2	t+3	Total
Exp. Cons.	-0.011	-0.008	-0.027**	-0.039***	-0.085**
	(0.010)	(0.011)	(0.010)	(0.010)	(0.036)
Exp. Stim.	-0.030***	-0.011	-0.029**	-0.033***	-0.099**
	(0.011)	(0.011)	(0.011)	(0.011)	(0.041)
Imp. Cons.	-0.030***	-0.023*	-0.022**	-0.024**	-0.104***
	(0.011)	(0.012)	(0.011)	(0.011)	(0.039)
Imp. Stim.	-0.019	-0.015	-0.016	-0.008	-0.058
	(0.013)	(0.013)	(0.013)	(0.013)	(0.048)
R^2	0.881				
Observations	14,441				
Year Effects	Yes				
Exp. and Imp. Effects	No				
Country-pair Effects	Yes				

Note: These are the estimated marginal effects when the indicated fiscal episode occurs in period t. The results are from a single regression, but are presented in multiple columns for readability. In addition, the control variables from Table 3.2 are included in the regression, but the coefficient estimates are omitted here for space considerations. Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

Table B.8: Marginal Effects of Fiscal Episodes Occurring Simultaneously in Each Country (Intensive Margin)

	t	t+1	t+2	t+3	Total
Exp. and Imp. Cons.	-0.041***	-0.030*	-0.050***	-0.063***	-0.184***
	(0.015)	(0.017)	(0.016)	(0.016)	(0.057)
Exp. and Imp. Stim.	-0.049***	-0.026	-0.045***	-0.041**	-0.162**
	(0.018)	(0.019)	(0.017)	(0.017)	(0.064)
Exp. Cons. and Imp. Stim.	-0.030*	-0.023	-0.043**	-0.047***	-0.143**
	(0.017)	(0.017)	(0.017)	(0.017)	(0.061)
Exp. Stim. and Imp. Cons.	-0.060***	-0.034**	-0.052***	-0.057***	-0.203***
	(0.017)	(0.017)	(0.016)	(0.015)	(0.057)

Note: Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

Table B.9: Conditional Effects of Successful Fiscal Consolidation

	t	t+1	t+2	t+3	Total
Total Exports:					
Exp. Cons.	0.012	0.069***	0.060***	-0.010	0.131*
	(0.023)	(0.021)	(0.021)	(0.019)	(0.074)
Imp. Cons.	-0.001	0.006	-0.009	-0.033	-0.037
	(0.020)	(0.021)	(0.021)	(0.020)	(0.071)
Exp. and Imp. Cons.	0.011	0.075**	0.052	-0.043	0.095
	(0.031)	(0.032)	(0.032)	(0.030)	(0.110)
Extensive Margin:					
Exp. Cons.	0.029***	0.037***	0.069***	-0.002	0.133***
	(0.009)	(0.008)	(0.011)	(0.009)	(0.031)
Imp. Cons.	0.007	0.005	<0.001	-0.003	0.009
	(0.011)	(0.011)	(0.012)	(0.012)	(0.040)
Exp. and Imp. Cons.	0.036**	0.043***	0.069***	-0.005	0.142***
	(0.015)	(0.015)	(0.017)	(0.016)	(0.054)
Intensive Margin:					
Exp. Cons.	-0.017	0.032*	-0.009	-0.008	-0.002
	(0.020)	(0.018)	(0.019)	(0.018)	(0.064)
Imp. Cons.	-0.008	0.001	-0.009	-0.030*	-0.046
	(0.018)	(0.019)	(0.018)	(0.017)	(0.064)
Exp. and Imp. Cons.	-0.025	0.032	-0.017	-0.038	-0.048
	(0.027)	(0.028)	(0.029)	(0.026)	(0.096)
Observations	14,441				
Year Effects	Yes				
Exp. and Imp. Effects	No				
Country-pair Effects	Yes				

Note: Separate regressions are run for Total Exports, the Extensive Margin, and the Intensive Margin, in which dummy variables are included for exporter and importer consolidations in t through $t+3$. These are the estimated marginal effects when the indicated fiscal episode occurs in period t. In addition, the control variables from Table 3.2 are included in the regression, but the coefficient estimates are omitted here for space considerations. Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

Table B.10: Conditional Effects of Fiscal Consolidation (IMF Definition)

	t	t+1	t+2	t+3	Total
Total Exports:					
Exp. Cons.	0.057*	0.096***	0.037*	-0.013	0.177*
	(0.031)	(0.033)	(0.020)	(0.020)	(0.093)
Imp. Cons.	0.007	-0.035	-0.017	-0.022	-0.067
	(0.029)	(0.024)	(0.021)	(0.021)	(0.082)
Exp. and Imp. Cons.	0.064	0.060	0.020	-0.035	0.109
	(0.043)	(0.039)	(0.029)	(0.030)	(0.120)
Extensive Margin:					
Exp. Cons.	0.006	0.047**	0.026**	-0.013	0.065
	(0.017)	(0.024)	(0.012)	(0.010)	(0.060)
Imp. Cons.	0.004	0.001	-0.001	-0.003	0.001
	(0.013)	(0.012)	(0.011)	(0.011)	(0.040)
Exp. and Imp. Cons.	0.010	0.048*	0.024	-0.016	0.066
	(0.022)	(0.028)	(0.018)	(0.016)	(0.075)
Intensive Margin:					
Exp. Cons.	0.051*	0.049**	0.011	<0.001	0.111
	(0.027)	(0.020)	(0.016)	(0.016)	(0.069)
Imp. Cons.	0.003	-0.037*	-0.016	-0.019	-0.069
	(0.025)	(0.021)	(0.016)	(0.017)	(0.065)
Exp. and Imp. Cons.	0.054	0.012	-0.004	-0.019	0.042
	(0.040)	(0.029)	(0.023)	(0.024)	(0.097)
Observations	5,965				
Year Effects	Yes				
Exp. and Imp. Effects	No				
Country-pair Effects	Yes				

Note: Separate regressions are run for Total Exports, the Extensive Margin, and the Intensive Margin, in which dummy variables are included for exporter and importer consolidations in t through $t+3$. These are the estimated marginal effects when the indicated fiscal episode occurs in period t. In addition, the control variables from Table 3.2 are included in the regression, but the coefficient estimates are omitted here for space considerations. Robust standard errors are in parentheses. Significance is denoted as follows: *** p<0.01, ** p<0.05, * p<0.1

Appendix: Essay 3

Variable Definitions are listed below. All variables are in logs, with the exception of the GDP per capita growth rates, the real interest rate, and the volatility measures. All data are collected from the World Bank's 2010 World Development Indicators database, with the exception of the education variable, which is collected from Barro & Lee (2010). In the cross-section context, variables are averaged over the period 1990-1999. In the panel context, variables are averaged over 5-year time periods.

Total Exports: Total exports of goods and services, as a percentage of GDP.

Manufacturing Exports: Manufacturing exports as a share of GDP; Manufactures comprise commodities in SITC sections 5 (chemicals), 6 (basic manufactures), 7 (machinery and transport equipment), and 8 (miscellaneous manufactured goods), excluding division 68 (non-ferrous metals).

Primary Exports: Agricultural and food exports as a share of GDP; agricultural exports comprise SITC section 2 (crude materials except fuels) excluding divisions 22, 27 (crude fertilizers and minerals excluding coal, petroleum, and precious stones), and 28 metalliferous ores and scrap); Food exports comprise the commodities in SITC sections 0 (food and live animals), 1 (beverages and tobacco), and 4 (animal and vegetable oils and fats) and SITC division 22 (oil seeds, oil nuts, and oil kernels).

Annual Average GDP per capita growth rate: Growth rate of GDP per capita, calculated as an annual average rate.

Working-age population growth rate: Annual average growth rate of the working-age (15-64) population.

Investment: Investment as a share of GDP; consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories.

Education: Percentage of the population (aged 15 years and older) with some secondary schooling

Tariff Rate: Weighted mean applied tariff is the average of effectively applied rates weighted by the product import shares corresponding to each partner country.

REER Index Volatility: The real effective exchange rate index is the nominal effective exchange rate divided by an index of costs (2005=100).

Government Debt: Debt data refer to gross central (as opposed as to general) government debt, as in Jaimovich & Panizza (2010).

Government Consumption: General government final consumption expenditure (formerly general government consumption) includes all government current expenditures for purchases of goods and services (including compensation of

employees). It also includes most expenditures on national defense and security, but excludes government military expenditures that are part of government capital formation.

Real Interest Rate: Real interest rate is the lending interest rate adjusted for inflation as measured by the GDP deflator.

M2: Money and quasi money comprise the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government.

Inflation: Inflation as measured by the annual growth rate of the GDP implicit deflator shows the rate of price change in the economy as a whole. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency.

Inflation Volatility: The standard deviation of the inflation rate.

Table C.1: Summary Statistics for Baseline Sample (Cross-section)

Variable	# of Co.	Mean	Std. Dev.	Min	Max
Total Exports	68	35.971	1.672	10.642	133.598
Manufacturing Exports	68	9.938	2.901	0.763	66.912
Primary Exports	68	3.825	3.132	0.116	39.872
Ann. Avg. GDP per cap. growth	68	1.255	2.880	-10.913	9.447
Working-age pop. growth	68	1.608	1.207	-0.495	3.522
Investment	68	21.496	1.259	11.307	39.054
Education	68	34.109	1.641	5.620	70.418
Tariff Rate	68	7.579	1.979	1.890	41.600
REER Index Volatility	68	10.644	8.308	1.677	34.919

Table C.2: Summary Statistics for Baseline Sample (Panel)

Variable	# of Co.	Obs	Mean	Std. Dev.	Min	Max
Total Exports	75	219	37.358	1.771	9.663	223.311
Manufacturing Exports	74	215	10.957	3.046	0.615	136.430
Primary Exports	74	215	3.423	3.148	0.077	45.468
Ann. Avg. GDP per cap. growth	75	219	1.926	2.674	-5.767	11.920
Working-age pop. growth	75	219	1.501	1.305	-2.252	5.494
Investment	75	219	21.238	1.282	7.821	32.283
Education	75	219	37.362	1.609	5.600	77.800
Tariff Rate	75	219	7.060	1.964	1.000	54.754
REER Index Volatility	75	219	7.617	9.878	0.458	117.820

Table C.3: Cross-Section Full Country List

Algeria	Gabon	Papua New Guinea
Australia	Germany	Paraguay
Austria	Ghana	Philippines
Bahrain	Greece	Poland
Belgium	Guyana	Portugal
Belize	Hungary	Romania
Bolivia	Iceland	Russia
Bulgaria	Ireland	Saudi Arabia
Cameroon	Israel	Slovakia
Canada	Italy	South Africa
Central African Republic	Japan	Spain
Chile	Luxembourg	Sweden
China	Malawi	Switzerland
Colombia	Malaysia	Trinidad and Tobago
Costa Rica	Malta	Tunisia
Cote d'Ivoire	Mexico	Uganda
Cyprus	Moldova	Ukraine
Czech Republic	Morocco	United Kingdom
Denmark	Netherlands	United States
Dominican Republic	New Zealand	Uruguay
Ecuador	Nicaragua	Venezuela
Finland	Norway	Zambia
France	Pakistan	

Table C.4: Summary Statistics from Complete Results (Cross-section)

Variable	# of Co.	Mean	Std. Dev.	Min	Max
Total Exp.	48	36.296	1.657	10.642	100.843
Manufacturing Exports	48	8.148	3.007	0.763	64.397
Primary Exports	48	4.291	3.430	0.116	39.872
Ann. Avg. GDP per cap. growth	48	0.993	3.235	-10.913	9.447
Working-age pop. growth	48	1.787	1.176	-0.495	3.522
Investment	48	21.839	1.282	11.307	39.054
Education	48	33.105	1.676	5.620	68.153
Tariff Rate	48	8.108	1.961	1.890	31.375
REER Index Volatility	48	11.643	8.182	1.677	34.919
Government Debt	48	52.079	2.174	11.073	446.416
Real Interest Rate	48	8.187	10.604	-19.161	40.327
M2	48	39.673	1.950	10.451	205.098
Inflation	48	10.433	5.614	0.154	972.202
Inflation Volatility	48	97.256	333.926	0.491	2,005.591
Government Consumption	48	15.975	1.334	9.208	28.284

Table C.5: Summary Statistics from Complete Results (Panel)

Variable	# of Co.	Obs	Mean	Std. Dev.	Min	Max
Total Exports	61	141	36.837	1.738	9.663	223.311
Manufacturing Exports	61	140	9.744	3.168	0.615	136.430
Primary Exports	61	140	3.532	3.209	0.077	45.468
Ann. Avg. GDP per cap. growth	61	141	1.824	2.727	-5.767	11.244
Working-age pop. growth	61	141	1.618	1.225	-1.195	4.562
Investment	61	141	21.484	1.280	8.543	39.283
Education	61	141	37.559	1.640	5.600	77.800
Tariff Rate	61	141	7.064	1.963	1.022	46.440
REER Index Volatility	61	141	7.736	6.279	1.182	37.462
Government Debt	61	141	47.924	1.979	8.820	286.092
Real Interest Rate	61	141	7.646	8.655	-26.753	45.081
M2	61	141	46.894	1.92	8.187	190.124
Inflation	61	141	6.402	3.019	0.340	236.169
Inflation Volatility	61	141	9.958	38.415	0.068	421.256
Government Consumption	61	141	16.151	1.361	7.215	37.743

Table C.6: Summary Statistics from High-Manufacturing-Exports Countries (Cross-section)

Variable	# of Co.	Mean	Std. Dev.	Min	Max
Total Exports	26	46.785	1.551	24.498	133.598
Manufacturing Exports	26	28.258	1.492	16.452	66.912
Primary Exports	26	3.221	1.983	1.054	11.633
Initial GDP	26	7,025.959	3.462	391.653	33,470.844
Ann. Avg. GDP per cap. growth	26	1.586	3.163	-8.984	9.447
Working-age pop. growth	26	0.984	1.136	-0.495	3.366
Investment	26	23.276	1.221	16.230	39.054
Education	26	44.719	1.289	22.306	70.418
Tariff Rate	26	5.385	1.706	3.378	26.230
Exchange Rate Volatility	26	9.015	7.134	1.677	30.250
Government Debt	25	43.300	2.352	2.840	124.760
Government Consumption	26	18.217	1.326	10.132	28.284
Real Interest Rate	25	4.503	5.297	-17.312	8.599
M2	18	49.540	1.818	13.073	122.589
Inflation	26	7.294	4.788	1.644	670.092
Inflation Volatility	26	60.420	219.397	0.557	1,096.949

Table C.7: Summary Statistics from Low-Manufacturing-Exports Countries (Cross-section)

Variable	# of Co.	Mean	Std. Dev.	Min	Max
Total Exports	42	30.569	1.639	10.642	98.032
Manufacturing Exports	42	5.204	2.219	0.763	16.407
Primary Exports	42	4.254	3.845	0.116	39.872
Initial GDP	42	2,728.870	4.632	132.506	33,595.251
Ann. Avg. GDP per cap. growth	42	1.586	3.163	-8.984	9.447
Working-age pop. growth	42	0.984	1.136	-0.495	3.366
Investment	42	20.464	1.267	11.307	4.441
Education	42	28.844	1.708	5.620	68.153
Tariff Rate	42	9.366	1.981	1.890	41.600
Exchange Rate Volatility	42	9.015	7.134	1.677	30.250
Government Debt	40	58.338	2.086	15.220	446.416
Government Consumption	42	5.002	1.358	5.022	27.257
Real Interest Rate	39	10.038	10.796	-19.161	40.327
M2	37	33.510	1.895	10.451	205.098
Inflation	42	9.108	5.069	0.154	972.202
Inflation Volatility	42	77.859	318.138	0.491	2,005.591

Table C.8: Summary Statistics from High-Manufacturing-Exports Countries (Panel)

Variable	# of Co.	Mean	Std. Dev.	Min	Max
Total Exports	112	46.961	1.684	15.650	223.311
Manufacturing Exports	112	26.615	1.681	12.818	136.430
Primary Exports	112	3.321	2.204	0.156	45.468
Initial GDP per capita	112	7,694.476	3.344	277.273	46,457.816
Ann. Avg. GDP per cap. growth	112	2.365	2.742	-5.196	11.244
Working-age pop. growth	112	1.012	1.181	-2.252	4.042
Investment	112	22.807	1.218	13.910	39.283
Education	112	44.936	1.335	18.400	77.800
Tariff Rate	112	5.484	1.790	1.000	31.130
Exchange Rate Volatility	112	5.904	5.335	0.458	43.390
Government Debt	101	45.563	2.126	1.940	286.092
Government Consumption	112	17.501	1.368	5.964	37.743
Real Interest Rate	103	5.364	4.297	-20.317	17.962
M2	81	60.839	1.881	11.814	605.675
Inflation	110	4.423	3.174	0.340	236.169
Inflation Volatility	112	60.420	219.397	0.557	1,096.949

Summary Statistics from Low-Manufacturing-Exports Countries (Panel)

Variable	# of Co.	Mean	Std. Dev.	Min	Max
Total Exports	102	28.279	1.636	9.663	85.512
Manufacturing Exports	102	4.158	2.037	0.615	12.616
Primary Exports	102	3.586	4.230	0.077	31.468
Initial GDP	102	2,743.717	4.992	111.237	37,472.777
Ann. Avg. GDP per cap. growth	102	1.406	2.491	-5.767	11.920
Working-age pop. growth	102	2.040	1.234	-1.195	5.494
Investment	102	19.870	1.307	7.821	34.648
Education	102	30.673	1.740	5.600	75.000
Tariff Rate	102	9.370	1.949	1.870	54.754
Exchange Rate Volatility	102	8.559	7.358	0.614	37.462
Government Debt	92	54.632	2.018	9.020	204.649
Government Consumption	102	14.707	1.351	7.215	28.871
Real Interest Rate	93	10.040	11.040	-26.753	47.696
M2	97	36.906	1.942	8.187	220.074
Inflation	99	7.217	3.037	0.237	114.729
Inflation Volatility	102	7.173	8.711	0.370	52.789

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