Using Disaggregated Trade Data as a Proxy for Productivity: Empirical Evidence for Africa

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One of the determinants of economic growth is total factor productivity but measurement of the variable, especially for Africa, is quite difficult. The measurement generally requires disaggregated (firm level) data which is lacking for a wide range of African economies. Hence, this paper attempts to explain Africa's growth by using disaggregated trade margins as a proxy for TFP. The reasoning is simple; manufacturing more types of goods requires more advanced technological inputs, subsequently higher levels of TFP. Thus, considering the volumes and diversity of certain imports and exports might yield a proxy for African productivity. This is done by following on Lall (2000) which categorizes trade data of goods into different levels of technological goods. The analysis is done with a panel of 52 African countries over a period of thirty years; country and yearly fixed effects are used to account for constant unobserved country and yearly heteregeneity. The results show that previous imports in medium technology goods significantly explain economic growth after controlling for other growth determinants. Moreover, exports in technologically advanced goods are not significantly related to growth, due to the nature of African exports. However, the intuition is that previous technology imports, and the skills and ideas associated with using the imports, contribute to current exports which leads to economic growth. These results are shown, but not for technologically advanced goods.

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1 Introduction

"Countries are what they export" (Hesse, 2009). The statement made by Hesse in his 2009 paper, which summarized the importance of export diversification in economic growth, is shown throughout trade and growth literature. There exists strong evidence in support of this argument, and the accepted view from most economists is that export diversification is in some way capturing changes in productivity. Hausmann & Rodrik (2003) proposes a measurement of productivity whereby the authors associate the level of productivity with a countries export basket. The authors find that countries producing high-productivity goods experience higher rates of growth relative to those countries that produce low-productivity goods. These results stem from the argument that commodity-based, or low-productivity manufacturing, countries can escape the resource curse if the institutions of the country can adequately transfer resources from low-productivity to high-productivity manufacturing. This result follows on Sachs & Warner (2001) which argues that developing countries need to reallocate revenue from commodity exports into entrepreneurial activities and manufacturing, which in turn leads to higher growth rates. In other words, countries that diversify their manufacturing base by shifting recourses from commodity-based manufacturing to more technologically advanced manufacturing, hence increasing productivity, tend to show higher growth rates.

Moreover, the dynamic industry model from Melitz (2003) emphasizes the role of export demand in industry level productivity changes. Melitz argues that only the most productive firms in a given country will enter the global market. This is due to the competitiveness that firms face on the global market, coupled with a reduction in trade barriers and transport costs which levels the playing field. Thus, the most productive firms are left operating and exporting, and the least productive firms are forced out of the global market. The continued exposure to world trade leads to inter-firm reallocations, whereby firms acquire the recourses from firms that could not produce efficiently enough to compete on the global market (Melitz, 2003). At this point, firms need to have specialized by adopting new ideas and refining those ideas to lower the cost of the production, or to lower the inputs required to operate. The result is that aggregate total factor productivity increases as export diversification increases. Moreover, Feenstra & Kee (2008) use instrumental variables for export variety to show that exports diversification is related with a constructed measurement of productivity. The authors find that export variety is positively associated with productivity increases for exporting countries. Their results also show that gains from increases in export variety to the US is higher than the gains from the US importing, meaning that the exporting countries benefited more from the exports, than the US did from those imports.

There also exists an argument for more specialized goods, and how more specialization leads to higher growth rates. Imbs & Wacziarg (2003) tests for the relationships between diversification and income per capita, and specialization and income per capita. The authors find a U-shaped curve whereby a country specializes in it's infancy, diversifies in the early-stages of growth, and then returns to specialization at higher income levels (Imbs & Wacziarg, 2003). This research captures the notion that developing countries are in their diversification stage given the type of institution, and more developed countries are in their product specialization stage. Although there exist multiple reasons for this relationship, the intuition is that resource rich countries can escape the recourse curse by adequately allocating commodity based revenue to the private and research and development, R&D from hereon out, sectors. This provides incentives for entrepreneurs to take on risky business ventures, where costs localized to entrepreneur and the benefit is spilled over to society, which would lead to higher implementation rates of ideas[1]. This process of entrepreneurial activities, coupled with R&D expenditure, brings the economy closer to it's productivity frontier (Hausmann & Rodrik, 2003). The rise in efficiency and cost-discovery by entrepreneurs spills over to other firms and industries in a country, which results in a wider range of exports(Feenstra & Kee, 2008). As the economy is growing, export demand for certain goods will rise given rising competitiveness from exporting firms (Melitz, 2003). Once the foreign demand for the product is well established, or less elastic, and the firms are able to make profit to allocate to R&D, specialization then occurs again but at a higher skill requirement (Imbs & Wacziarg, 2003). This process leads to diversified and, in turn, specialized export growth.

On the other hand, changes in productivity can largely be attributed to expenditure on R&D and the development of high learning goods [2]. Changes in productivity at the industry level, learning by doing and the adoption of new ideas and technologies, lead to more competitive prices on global markets. The creation of new ideas and technologies fall largely within the industries spending recourses on R&D as well as firms outside the industry developing new ideas for production (Keller, 2000). This spillover effect of ideas, coupled with growth in international trade, leads to developing countries importing more differentiated and higher quality goods. Keller (2000) considers the question of whether imports effect economic growth. The author argues that some of the ideas generated by R&D expenditure in developed countries, which are close to the technological frontier, are imported by countries far from the technological frontier, or developing countries. The intuition is that importing high technology goods is coupled with a learning-by-doing process for the importing firm. The author shows that foreign R&D plays a role in productivity gains if the domestic and foreign R&D differs. This is the arguments for developing countries, in that the R&D is lower and less developed. In other words, using a technologically advanced goods might require a certain level of skill, which is attained through education or learning-by-doing. This process of using higher tech goods might facilitate learning about the product, spurring imitation or innovation of a competing product Keller (2000). The result is that overall increases in imported and exported R&D, resulting from domestic and foreign efforts, leads to higher productivity. This method of redistributing and imitating ideas can be considered, in part, as the diffusion of technology.

The diffusion of technology, or the transfer of productivity, is facilitated in part by international trade (Helpmann 1997). This paper follows on Hummels & Klenow (2005) which makes use of the intensive and extensive trade margins to analyze the importance of trade diversification in growth. The authors find that trade diversification plays a more prominent role than trading

[1] See Sachs & Warner (2001) and Hausmann & Rodrik (2003) for a description of the diversification process.

[2] Romer (1986) shows the importance of R&D expenditure in human capital formation and Goh & Olivier (2002) relates the importance of the learning-by-doing process and importation of cheap capital for developing countries

higher volumes in economic growth. Moreover, they find that richer countries export more units at higher prices, indicating that rich countries export higher quality goods. In other words, richer economies trade more and higher quality goods, which follows on economic intuition.

This paper considers the impact of the diffusion of technology for Africa. It analyzes the impact of exporting and importing a more diverse set of technologically advanced goods, as well as higher volumes of those goods, on economic growth. It does so by utilizing the margins of trade used by Hummels & Klenow (2005) and by making use of the technology classifications used by Lall (2000)[3] which can be viewed as disaggregated trade margins. In other words, the goal is to use disaggregated trade margins to test for a relationship between technologically advanced goods and economic growth. The intuition is that more technologically advanced goods carry with it a level of productivity, and that importing and exporting these goods diffuses technologies across countries. From this, we would expect that importing technologically advanced goods and exporting a more diverse set of goods is capturing productivity, especially learning by doing. MOreover, to capture thew learning by doing process, I regress the lags of each of disaggregated trade margins on log of GDP per capita, to see how certain products effect growth over time.

Moreover, the argument of the paper is that developing countries, in this case Africa, that import technologically advanced goods are also importing some of the R&D from richer countries. That is, based on the evidence shown by the literature, that richer countries export technologically advanced goods and developing countries import goods that require a certain level of skill. The process of acquiring the skill can be viewed as the learning by doing process. In this process, human capital on the goods and how to use it, accumulates. The result is higher levels of productivity, spilling over to some sectors in the economy. From hereon, section 2 goes through the methodology and data of the paper, section 3 represents the results and section 5 concludes. The appendix, tables and graphs can be found in section 6 of the paper.

[3]Lall classifies SITC data into six categories, five of which this paper describes in the methodology section

2 Methodology

2.1 The margins of trade

The method of estimating the intensive and extensive margins comes from decomposing the well-known gravity equation. There exist many different methodologies for calculating margins of trade[4], yet this paper follows the methodology used by Hummels & Klenow (2005) that decompose trade into the extensive and intensive margins. However, this paper uses an adjusted version of the method used by Hummels & Klenow (2005) since the original method is applicable to cross sectional data and this paper uses panel data. The method is based on Baier et al. (2014) who apply the Hummels & Klenow (2005) method to panel data, and Feenstra & Kee (2008) who redefine the extensive margin so that it is consistent over time and countries (see also Clance (2015))[5]. By combining elements from Baier et al. (2014) and Baier et al. (2015) the specification of trade takes the form

$$X_{ijt} = \widetilde{EM}_{ijt} * \widetilde{IM}_{ijt} * \overline{X}_{jt} \ ,$$

This is known as the gravity equation. Taking logs yields

$$x_{ijt} = em_{ijt} + im_{ijt} + x_{jt}$$

where the lower case letters indicate the logged values of bilateral trade, the extensive and intensive margins, and imports to the country under observation. The variable x_{ijt} is bilateral exports between country i to country j over time t, em_{ijt} and im_{ijt} are the extensive and intensive margins for exports from country i to country j, and x_{jt} is the total imports from country j. From this method it is possible to decompose the margins of trade and x_{jt} is captured by importer-year fixed effects (Clance, 2015). Using Feenstra & Kee (2008) to modify the methodology of Baier et al. (2014) yields the redefined extensive export margin, defined as

$$\widetilde{EM}x_{ijt} = \frac{\sum_{\omega \epsilon \Omega_{ijt}} \overline{X}^{\omega}_{kj}}{\sum_{\omega \epsilon \Omega_{kj}} \overline{X}^{\omega}_{kj}} \tag{1}$$

where Ω_{ijt} is the set of varieties exported from country i to country j in year t and $\overline{X}^{\omega}_{kj}$ is the average real value of imports across all years. Ω_{kj} represents the total set of varieties imported by country j from country k across all periods. Hence, the extensive margin will vary across years and/or countries due to variation in Ω_{ijt}. Following on Feenstra & Kee (2008), this yields a comparable basket of goods across the panel (Clance, 2015). $\widetilde{EM}x_{ijt}$ represents the fraction of all goods exported form i to j within the set of varieties observed Ω_{kj}, weighted by the imports of j from the country k. This shows the importance of the exports from i to j (see also Clance (2015) and Baier et al. (2014)).

[4]Such as the Krugman model, see Hummels & Klenow (2005)

[5]The Hummels & Klenow (2005) method is only consistent across countries, but not across time

The intensive export margin is defined as

$$\widetilde{IMx}_{ijt} = \frac{\sum_{\omega\epsilon\Omega_{ijt}} X_{ijt}^{\omega}}{\sum_{\omega\epsilon\Omega_{ijt}} \overline{X}_{kj}^{\omega}} \tag{2}$$

where X_{ijt}^{ω} is the real value of trade in product ω in year t, and Ω_{ijt} the set of goods. Hence, $\widetilde{IMx}_{ijt}$ represents the market ratio of j's imports from i in year$t$ relative to imports of j from k of the same goods set (Clance, 2015). This methodology still yields the gravity equation specified above.

Similarly, the extensive import margin takes the form

$$\widetilde{EMi}_{jit} = \frac{\sum_{\omega\epsilon\Omega_{jit}} \overline{X}_{ik}^{\omega}}{\sum_{\omega\epsilon\Omega_{ik}} \overline{X}_{ik}^{\omega}} \tag{3}$$

where Ω_{kj} represents the total set of varieties across all periods exported from country k to country the destination country i, and $\overline{X}_{ik}^{\omega}$ is the average real value of exports of k across all years. The extensive import margin ($\widetilde{EMi}_{ijt}$) is a measure of the fraction of all products that are imported by i from j in year t, where each product is weighted by all products imported by i from k over all periods. This shows the importance of imports from country j to country i

The intensive import margin takes the form

$$\widetilde{IMi}_{jit} = \frac{\sum_{\omega\epsilon\Omega_{jit}} X_{jit}^{\omega}}{\sum_{\omega\epsilon\Omega_{jit}} \overline{X}_{ik}^{\omega}} \tag{4}$$

where X_{jit}^{ω} is the real value of trade in product ω in year t. $\widetilde{IMi}_{jit}$ represents the market ratio of i's imports from j in any given year to the average real value of imports of i from k of the same goods set across all years.

The margins are included in a growth regression to determine the individual and joint effects of the margins on economic growth. Other determinants of economic growth are included in the model to control for factors that are known to affect growth. The equation takes the specification

$$\begin{aligned} \ln RGDPpc_{it} = {} & \ln EXext_{ijt} + \ln IMext_{ijt} + \ln EXint_{ijt} + \ln IMint_{ijt} + \ln Polity4_{it} \\ & + \ln Opnness_{it} + \ln GrossEnrollment_{it}, \end{aligned} \tag{5}$$

where $\ln RGDPpc_{it}$ is log of real GDP per capita, $\ln EXext_{ijt}$ is the log of the exporters extensive margin, $\ln IMext_{ijt}$ is the log of the importers extensive margin, $\ln EXint_{ijt}$ is the log of the exporters intensive margin, and $\ln IMint_{ijt}$ is the log of the importers intensive margin. $\ln Polity4_{it}$ is the log of the polity4 index variable, $\ln Opnness_{it}$ is the log of merchandise trade as a percentage of GDP, $\ln GrossEnrollment_{it}$ is the log of gross enrollment ratio.

2.2 The Disaggregate margins

The disaggregate margins are calculated with the standard margins, but are calculated as subsets of the SITC data. Hence, there exist a margin for each technological classification of goods. The SITC data is classified according to the classifications made by Lall (2000). Lall (2000) classifies the products into 6 technological classifications. The products are classified according to the amount of skill or human capital needed to produce certain goods. The lower-end classifications are commodities and natural based manufacturing which consists of agricultural goods, crude petroleum, petroleum products, glass etc[6]. Moreover, Lall (2000) classifies goods such as clothing, furniture, plastic products and more as being low-technology manufacturing, or low-tech goods. Medium-technology goods are classified by motor vehicles, fertilizer, industrial machinery and more. High-technology goods are classified by highly skilled manufacturing, such as the manufacturing of data processing equipment, turbines, pharmaceuticals etc. The final classification consists of other goods that vary in skill inputs like film and printed matter. Overall, these classifications capture up to 90 percent of the goods in the SITC revision 2 dataset. Thus, in total there are 20 margins of trade, each for the margins and for imports and exports, and four for each of the five product classifications used for this paper. The structure of the regressions are the same as equation 5, but differ as the results are not presented in horse race fashion.

Some econometric issues arise when using statistical modeling. Serial correlation may be present since there could be some country specific factors which are unobserved that may lead to sample bias. These factors - which may include culture, religion and types of institutions within the country - are constant over time and have to be controlled for. For these problems, the regressions in of the paper make use of country and yearly fixed effects to eliminate any country or yearly specific unknown heterogeneity within the data, thus mitigating some of the possible endogeneity that exists within the model.

[6]see . . . for breakdown

3 Data

The disaggregated bilateral trade data is collected from the UN COMTRADE database and is reported at the 5 digital Standard International Trade Classification (SITC version 1) level for the years 1969-2012[7]. Using the method specified in section 3, the trade data is decomposed into the margins of trade. The rest of this paper makes use of other panel data for the same period which includes 53 African countries. The dataset contains other macroeconomic growth variables to control for factors that are known in the existing literature to be determinants of economic growth. These factors are real GDP per capita as a measure for living standards, gross primary enrollment ratio and pupil-teacher ratio as measures for human capital, merchandise trade as a percentage of GDP as a measure for openness, and an index named Polity4 that measures political stability within a particular country.

The measurement for living standards was obtained from the United States Department of Agriculture and is measured in constant 2010 USD per capita terms[8]. The measurements for human capital were obtained from the World bank along with the measurement for openness. The former are gross primary school enrollment ratio for both sexes and the pupil-teacher ratio in primary education (headcount basis). The latter is merchandise trade as a percentage of GDP which is used rather than trade as a percentage of GDP since Africa does not necessarily export services or capital[9].

The measurement for political stability was obtained from the The Center for Systemic Peace website and is an autocratic/democratic index ranging from -10 to 10, where -10 represents the strongest form of an autocracy and 10 represents the strongest form of a democracy[10]. The Polity4 variable was transformed into an index that ranges from 0 to 1 in order to use the logged values. All variables are logged before being included in the regressions which partially measure the effects of the linear changes in the logged explanatory variables on the logged dependent variable. The dependent variable is thus log of real GDP per capita and the explanatory variables are the logged intensive and extensive margins, log of gross enrollment ratio, log of pupil-teacher ratio, log of merchandise trade and log of the adjusted Polity4 index.

4 Results

Tables 1 and 2 (see section 6) contain the main findings of the model depicted in Equation 5, using the current and lagged versions of the margins. The regressions are depicted in horse race regression format to analyze the individual and joint effects of the margins on the log of income per capita. Tables 3 and 4 show the disaggregated margins, again for both the current and lagged versions of the margins. [11].

[7]The data is accessible from United Nations at http://comtrade.un.org/

[8]The data can be dowloaded from United States Department of Agriculture at https://www.ers.usda.gov/datafiles/International_Macroeconomic_Data/Historical_Data_Files/HistoricalRealGDPValues.xls

[9]The data can be dowloaded from World Bank at http://data.worldbank.org/data-catalog/world-development-indicators

[10]The data can be dowloaded from The Center for Systemic Peace at http://www.systemicpeace.org/inscrdata.html

[11]Denoted as EXexp, EXimp, IMexp,IMimp for each margins and for exports and imports separately.

4.1 Results at the aggregate level

The results at the aggregate level give uncertain results with respect to the hypothesis. The extensive export margin plays the largest role in income per capita growth, whereas the import margins are insignificant when other growth factors are included. However, the lagged versions tell a clearer story. From table 2, column 7, one can see that both export margins are significant and that the extensive import margins are significant. These preliminary results show the underlying intuition, whereby diversified African exports and imports explain African growth as a proxy for productivity.

Table 1 shows the estimation results for the aggregate margins without any lags. The results follow on economic intuition, whereby the extensive export margin is significant and positive. This result is in line with theory which suggests that the extensive export margin, or export diversification, is proxying for productivity. The extensive export margin is significant at the individual and joint level, represented by columns 2 and 7. This means that export diversification growth does play a role in income per capita growth in Africa, and that there were countries which diversified their export base. This result follows on the intuition that some countries have markets that are, at some level, competitive on the global market. However, this result might be due to changes in commodity prices, or the increase demand from other nations opening up to trade. Thus, further consideration needs to be given to which exports contributed to income growth.

On the other hand, extensive imports are weakly significant, but positive. This result does not point to the hypothesis that imports might be contributing to productivity growth in Africa. The result is significant, but becomes jointly insignificant when it the lagged version is used in the growth regression. It is individually significant, but drowns out when it and the other margins are jointly regressed [12]. For the lagged regressions the extensive export margin is still significant and positive, although it is smaller in magnitude, representing a diminishing effect. Thus, the aggregate results are in line with the contemporary theory in that export diversification has a positive relationship with long term growth in income per capita.

4.2 Results at the disaggregate level

Tables 3 and 4 show the estimation results from the disaggregated margin regressions and the lagged versions thereof. The different classifications of the margins are represented by the columns which are ranked in order of the technological importance. From the outset it is clear that the estimations show a similar story as the aggregated estimations form table 1.

Columns 1 and 3 from table 3 follows on the results of Hummels & Klenow (2005) which shows that trade diversification plays a more prominent role in income per capita than increasing trade volumes. Moreover, column 1 represents the recourse curse, in that increased trade in commodities does not necessarily lead to higher growth in the long run. Moreover, the trade from Africa is dominated by the commodity industries.

[12]See columns 5 to 7 in Table 2

The results for the import margins also tell a interesting story. The intensive import margin for the high tech and low tech classifications are weakly significant. This shows evidence that increasing the volume of African imports did effect current growth. The intuition is that importing more of the same goods that require higher levels of skill and capital to produce does impact current African income. In other words, this result might be capturing some spillover of productivity, as importing goods with more R&D brings more R&D into the African economy.

Table 4 shows the estimation results for the lags of each of the technology classification. Column 1, the commodity margins, are lagged with two periods for the intuition that commodities do not carry with it a learning by doing process which is beneficial to income. The results are similar to that of table 3, but the lag is significant. Column 2, representing the natural based manufacturing margin estimates which was lagged twice, shows a similar result. There is not a learning by doing process which contributes to growth, and the impact of the extensive export margin remains insignificant over time.

However, the lagged estimates for the technologically advanced classifications do not lose significance, represented by columns 3 to 5. The low and medium technology classification margins are both lagged by two periods, and the high technology margins are lagged by three periods. The results for the lagged extensive export margins are similar to that of table 3; only the extensive export margin for low tech goods is significant, but now it is for the lag. This is indicative of the change in productivity. Previous diversification is a result of increased efficiency, which shows up in current growth. This means that production methods take a bit of time to influence the economic growth rates of African counties.

Moreover, the results for the import margins show an interesting result. The impact of intensive imports of technological advanced manufactured goods persist through time, meaning that past imports affects current income. This highlights the learning by doing process, as it takes time to learn how to use more advanced goods. A interesting result comes from the diversification of medium technology imports. After being lagged by 3 periods, the extensive import margin for medium technology goods becomes significant at the 5 percent level. This result emphasizes that importing a more diverse set of high tech goods caries with it a more diverse set of R&D. As a result, in the future countries import higher volumes of these goods, as the intensive imports margin becomes significant. The intuition behind it is that these high tech goods carries with it a lot of R&D, which carries more ideas. These spilled over ideas can spur on new ideas and imitation, as mentioned by Keller (2000). In other words, importing a more diverse set of ideas might be a catalyst for idea generation in the future.

5 Conclusion

To conclude, the results follow on economic and practical expectation. Firstly, African countries mostly export commodities and low technology products. The diversification of goods do however contribute to growth rates. This is expected, as theory states that productivity is captured in export diversification. Moreover, the results from imports also follow expectation. Previous diversification of imports leads to intensive imports in the current period. These results also suggest that imports carries with it R&D from developed countries. In other words, when countries import a lot of goods that are technologically advanced, they also import R&D embedded into those goods. This is part of the diffusion of technology. Thus, a country is not just what it exports, it is also what it imports.

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6 Tables and Figures

6.1 Figures

6.2 Tables

Table 1: Aggregate Margins with fixed effects

	1	2	3	4	5	6	7
EXexp		0.033***				0.037***	0.037***
		(0.009)				(0.009)	(0.011)
IMexp			0.019**			0.024**	0.021**
			(0.008)			(0.009)	(0.010)
EXimp				0.089***		0.074***	0.030
				(0.028)		(0.026)	(0.019)
IMimp					0.016	0.013	0.017
					(0.010)	(0.010)	(0.011)
Polity4	0.003						0.005
	(0.003)						(0.004)
Gross.enr.ratio	0.063**						0.048
	(0.029)						(0.029)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R2	0.065	0.084	0.078	0.085	0.074	0.105	0.121
Obs	1122.000	1394.000	1394.000	1394.000	1394.000	1394.000	1050.000

Standard errors in parentheses

* $p < .10$, ** $p < .05$, *** $p < .01$

Table 2: Aggregate Margins with fixed effects, including multiple lags

	1	2	3	4	5	6	7
EXexp		0.031***				0.034***	0.032***
		(0.009)				(0.009)	(0.011)
IMexp			0.021**			0.026***	0.022**
			(0.008)			(0.010)	(0.010)
EXimp				0.105***		0.091***	0.055***
				(0.028)		(0.026)	(0.019)
IMimp					0.013	0.009	0.016
					(0.010)	(0.011)	(0.010)
EXexplag2		0.015**				0.020***	0.017**
		(0.007)				(0.007)	(0.008)
IMexplag2			0.009			0.015**	0.006
			(0.006)			(0.006)	(0.005)
EXimplag2				0.043		0.036	0.034*
				(0.027)		(0.026)	(0.019)
IMimplag2					-0.003	-0.006	0.005
					(0.009)	(0.008)	(0.008)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R2	0.065	0.086	0.083	0.094	0.075	0.116	0.133
Obs	1122.000	1382.000	1382.000	1382.000	1382.000	1382.000	1040.000

Standard errors in parentheses

* $p < .10$, ** $p < .05$, *** $p < .01$

Table 3: Disaggregate margins with fixed effects

	com	Nat	Low	Med	High
EXexp	0.022***	0.006	0.011**	0.000	0.001
	(0.007)	(0.004)	(0.005)	(0.003)	(0.004)
IMexp	0.009**	0.005*	-0.004	0.005	0.002
	(0.004)	(0.003)	(0.003)	(0.004)	(0.002)
EXimp	-0.001	0.015	0.011	0.018	-0.020
	(0.004)	(0.009)	(0.014)	(0.027)	(0.022)
IMimp	0.004	0.010	0.018*	0.012	0.016***
	(0.003)	(0.008)	(0.009)	(0.007)	(0.005)
Polity4	0.007*	0.005	0.005	0.005	0.006*
	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)
Gross.enr.ratio	0.053*	0.050*	0.045	0.044	0.046
	(0.029)	(0.029)	(0.032)	(0.028)	(0.030)
Country FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Adjusted R2	0.098	0.087	0.096	0.091	0.094
Obs	1050.000	1050.000	1050.000	1049.000	1049.000

Standard errors in parentheses

* $p < .10$, ** $p < .05$, *** $p < .01$

Table 4: Disaggreggate margins with fixed effects, including lags

	com	Nat	Low	Med	High
EXexp	0.022***	0.006	0.008	-0.001	0.002
	(0.007)	(0.005)	(0.005)	(0.003)	(0.004)
IMexp	0.008*	0.006**	-0.001	0.004	0.002
	(0.004)	(0.003)	(0.003)	(0.004)	(0.002)
EXimp	0.001	0.022***	0.018	0.021	-0.023
	(0.004)	(0.008)	(0.014)	(0.028)	(0.022)
IMimp	0.002	0.011	0.023**	0.015**	0.016***
	(0.004)	(0.008)	(0.009)	(0.007)	(0.005)
EXexp lag	0.014***	-0.000	0.008**	-0.001	0.001
	(0.005)	(0.004)	(0.004)	(0.003)	(0.004)
EXimp lag	-0.004	0.021	0.006	0.044**	0.027
	(0.004)	(0.013)	(0.018)	(0.021)	(0.017)
IMimp lag	-0.006**	-0.000	0.012	0.010	-0.001
	(0.003)	(0.006)	(0.009)	(0.007)	(0.005)
Polity4	0.007*	0.005	0.006	0.006*	0.006*
	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)
Gross.enr.ratio	0.055*	0.048	0.042	0.040	0.056**
	(0.029)	(0.029)	(0.033)	(0.029)	(0.026)
Country FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Adjusted R2	0.110	0.096	0.105	0.098	0.101
Obs	1040.000	1037.000	1040.000	1039.000	1027.000

Standard errors in parentheses

* $p < .10$, ** $p < .05$, *** $p < .01$