Cross-Border Trade Competition and International Stock Return Comovement*

Sungjune Pyun[1] and Johan Sulaeman[2]

[1]Yonsei University School of Business

[2]National University of Singapore

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ABSTRACT

Stock markets of countries that actively engage in international trade may move together more or less depending on their international trade linkages. This paper demonstrates that the stock markets of two countries are less likely to move together if these countries compete intensely in their export product markets. This is in contrast to the higher stock co-movement of countries that share similar exposures to common demand shocks. The empirical patterns imply that stronger cross-border trade linkages may not result in higher cross-market return correlations.

I. Introduction

The last several decades have seen a rise in globalization as a result of rapid technological developments and lower transportation costs. A particularly salient component of globalization is the cross-border flow of goods, which has grown substantially over this period. The proportion of cross-border trades to total global Gross Domestic Product (GDP) increased from 13% in 1970 to 29% in 2021 (World Bank). With cross-border trades connecting economies around the world, the increase in global trade is commonly perceived to positively impact the comovement of stock returns across markets, as local demand shocks reverberate through the global trade network.[1]

However, trade linkages may not necessarily imply a higher return correlation across markets. For example, for two countries that compete intensely in a common market, a positive production shock in one of the countries would result in lower product prices in the common market, potentially harming the competitor country, as highlighted by Krugman, Obstfeld, and Melitz (2015) in their classical international economics textbook. More generally, countries producing similar goods may observe a lower stock market correlation due to product market competition in common markets.

The potentially negative effect of this "competition" channel on return correlations may be muted as countries competing for market shares in common export markets are also exposed to common demand shocks in those markets. Two countries sharing common export markets would have increased shared exposures to the demand fluctuations in their common markets, with a demand shock in one of those markets affecting the stock returns of these two countries in the same direction, leading to a higher correlation between their stock markets.

[1] Bekaert and Harvey (2000), Griffin and Stulz (2001), Bekaert, Harvey, and Ng (2005) Forbes (2004), Baele (2005), and Eiling and Gerard (2015), among others, either assume or document a positive relationship between equity market correlations and globalization.

This paper studies whether the stock markets of countries that compete fiercely in a common export market are characterized by lower or higher cross-market return correlations. After disentangling the product market "competition" channel from the shared exposure to "common demand" shocks, we demonstrate that more intense product market competition leads to a lower comovement of country-level stock market returns. Our novel finding provides a prospective explanation for the surprisingly limited evidence of increased cross-market correlations in recent years, as highlighted in Bekaert, Hodrick, and Zhang (2009) and Bekaert, Ehrmann, Fratzcher, and Mehl (2014).

We begin our analysis by developing a simple model that links cross-border trade activities with stock return comovement. Based on this model, we construct two trade measures that capture (1) the extent of product market competition and (2) the shared exposure to common demand fluctuations, respectively, between a pair of countries. The first measure is based on the competition measure developed in Glick and Rose (1999), which measures the extent to which two focal countries compete in other countries, i.e., their shared export markets. We construct a measure of product market competition between a pair of countries at the granular product level and then aggregate them to the country-pair level. We develop the second measure to capture common demand exposure based on the similarity of export destinations between the two countries. Instead of focusing on shared exposure at the product level (as in the first measure), this "common demand" measure is estimated using country-level aggregate exports. For example, when firms in two countries export different goods to a common market, they would both be subject to common demand fluctuations arising from the common market.

Our results indicate that these two related but distinct dimensions of cross-border trade linkages affect the stock market return relationships in opposite directions. First, a more intense product market competition between a pair of countries is associated with a lower return comovement between the respective stock markets of those countries. Second, when a pair of countries have higher shared exposures to common export destinations at the aggregate level, their stock markets are more likely to move together. These results suggest that more intensive cross-border trade linkages may imply a higher or a lower stock market return correlation, depending on the intensity of product market competition.

We begin our analysis at the country level. We document a strong negative relationship between these comovement measures and cross-country product market competition. That is, the stock markets of countries that compete more with each other in the product market move less together with the competing country's stock market. This pattern is robust after controlling for various other trade-based measures, such as exposures to common shocks in demand and supply, and other country-pair specific variables such as geographical location. The pattern remains robust when the index returns are denominated in their respective local currencies.

To validate our hypothesis that the lower comovement is driven by product market competition, we further extend our analysis to the industry level. We examine whether firms in the same industry, competing in a common market but located in two different countries, are more likely to exhibit lower stock return correlation, compared to firms in the same industry but in different countries exporting products to different destinations. Our analysis indicates that country-pairs of industries that highly compete in a common product market are likely to show a lower stock return correlation. This result is robust to controlling for various fixed effects.

We propose that the export product market competition between firms across a pair of countries is an important determinant of the stock market correlation between the two countries. Since competition occurs at the product market level, this hypothesis assumes that a supply shock in one country, rather than a demand shock, would negatively impact the stock price of the competing country. To validate this assumption, we use the OECD input-output table to determine the upstream and downstream industries of each country-industry. Then, we test whether a positive shock to the upstream industry of the competing country-industry negatively affects the stock prices of the focal country-industry. Consistent with our hypothesis, we find that the stock prices of upstream industries of the competing country-industry move together less with the focal country-industry if the two countries compete intensely in the industry's common export market.

We expect the opposite effect for downstream returns because if two countries export their products to a common destination, a positive demand shock from the exporting country should positively affect the industries of the competing countries. Therefore, we expect the focal country-industry returns to be positively correlated with the downstream industry returns of a competing country-industry. Our empirical analysis shows a positive effect, which aligns with our theoretical prediction.

We also test whether the negative comovement of country stock returns for competing countries is mainly driven by cash flow shocks or discount rate shocks. We hypothesize that cash flow shocks should mainly lead to lower comovement because lower exports (cash flow) of the competing firm should directly affect the focal firm. The propagation channel for the discount rate shocks is less clear-cut. Studying the US as a baseline is natural, because discount rate measures can be estimated with less noise using US data. With the US having the largest stock market in the world and also being the major trade partner to many countries around the world, it is also natural to test our hypothesis from the US perspective.

Using weekly and monthly stock returns, we find analogous results to the global panel using the US as a focal country. To test the significance of discount rate shocks as the driver of the lower correlation between highly competing countries, we use the monthly fluctuation of the price-to-dividend ratio, the variance risk premium, and the term spread as proxies for discount rate shocks. Then, we test whether competing countries' stock returns move less with the discount rate driven fluctuation in US stock returns (the predicted component) or the residual component. We find that the lower comovement between US stock returns and the competing country's stock returns is mainly driven by the cash flow shock component.

This article contributes to the growing literature that examines the relationship between international asset return correlations and cross-border trades. Previous studies have explored this link in various contexts, such as the foreign exchange market during currency crises (Glick and Rose 1999), the international stock return predictability during Asian and Russian debt crises in the late 1990's (Forbes 2004), and the relationship between direct trade and cross-country factor loadings (Forbes and Chinn 2004). We offer a distinct perspective by examining how product market competition in export markets affects stock market comovement. Our framework implies that a country can benefit from shifting consumer demands in export markets, particularly when its competitors suffer.

Recent research on cross-country return correlations has identified a number of factors that contribute to the comovement of stock markets across different countries. Bekaert and Harvey (2000), Bekaert, Harvey, and Lumsdaine (2002), Gelos and Wei (2005), and Hau and Rey (2006), among others, focus on the role of cross-border asset holdings, while Bekaert, Harvey, Lundblad, and Siegel (2013) highlights the impact of political risk and the degree of economic development. Morck, Yeung, and Yu (2000) attribute high stock return comovement of emerging market countries to property rights. Eun, Wang, and Xiao (2015) argue that cultural variables are important determinants of cross-country stock correlations. The current study documents the relevance of international trade dynamics on the comovement in international stock markets.

Other studies focus on the time-series dynamics of the correlations. Bekaert, Ehrmann, Fratzcher, and Mehl (2014) contend that local factors become more important than global factors during times of crises, leading to a disintegration of the global market. Eiling and Gerard (2015) study the time trend in the cross-country and cross-region correlations. They find that the positive trend in the correlations is closely related to the openness of the world.

To enhance our contribution to this literature, we perform various robustness tests to show that the effect of product market competition on equity index comovement is separate from these previously documented variables. This study highlights the importance of a deeper dive into the dynamics of the growing international trade linkages.

While previous research has explored the link between product market competition and the cross-section of stock returns, the majority of this literature has focused on US domestic returns. Hoberg and Phillips (2010) find that comovement in equity returns is lower for concentrated industries. Lang and Stulz (1992) and Jorion and Zhang (2007) find that upon bankruptcy, a positive return is observed for firms that compete fiercely with the defaulted firm. Ahern (2014) argues that stocks of firms in less competitive industries are more elastic because they have closer substitutes than stocks in more competitive industries. The results of this paper support the notion that product market competition can result in lower comovement in stock prices, and provide a more general set of consistent empirical evidence across countries.

II. Trade Competition and Equity Returns

Cross-border trade activities are commonly perceived to increase the cross-country comovement of stock markets. Nevertheless, the net effect of international trade exposures on the correlation between the stock markets of countries exporting to the same markets could be ambiguous. Two countries that share a common export market could have a higher stock market comovement, as they face similar *demand shocks* emanating from their shared export market. However, cross-market stock correlations of these two countries may also be lower if they *compete* intensely in the same product markets. A negative productivity shock in one of the exporting countries could hurt its competitiveness and benefit another country it competes with, in the same product market. The following example illustrates these conflicting effects.

Japan and Korea are two geographically proximate countries in Asia. Both focus on the electronics and automobile industries, and they share a similar industry structure. Given their high trade openness, their stock markets are affected by similar regional or industry-specific demand shocks. One would, therefore, presume their stock returns would be highly positively correlated. At the same time, these two countries often compete in international markets exporting similar products. A negative productivity shock in one of the countries would lead to an increase in the competitiveness of the second country in their shared product markets. Highlighting this competition channel, following the 2011 Tohoku earthquake in Japan, the costliest natural disaster in recent history, the Korean stock market index (KOSPI) increased by more than 12% whereas the Japanese index (TOPIX) decreased by 10.6% in the two months following the earthquake.

To further illustrate this essential idea, consider a simple static model of an international economy with a variety of products. For simplicity, we assume a Cobb-Douglas utility function for the representative consumer in country $i \in \mathscr{I}$ who consumes a variety of products $X_1, X_2, \ldots, X_w \in \mathscr{X}$. We denote the utility function for the representative consumer of country i by

$$U_i = \prod_k X_{i,k}^{\alpha_k} = \prod_k (\sum_{\Omega_{i,k}} x_{i,j,k})^{\alpha_k}, \tag{1}$$

where $x_{j,i,k}$ is the amount of product k produced in country j that is exported to country i, $\Omega_{i,k}$ is the set of all countries that exports product k to i, and $\sum_k \alpha_k = 1$.

As in Melitz (2003), we assume heterogeneous production technology across countries. The firm producing product k in country j maximizes the profit function:

$$\max_{x_{j,i,k}} P_k x_{j,i,k} - \frac{w_j \tau_{j,i}}{\phi_j} x_{j,i,k},$$

where w_j is the unit labor cost for country j, $\tau_{j,i} \geq 1$ is the iceberg transaction cost between countries j and i as in Krugman (1991), and ϕ_j is the marginal productivity of the labor force in country j.

For product k_0, we assume that only countries j_0 and j_1 produce and export it to country i. For simplicity, we assume that no other products are jointly produced by these two countries (i.e, $\Omega_{i,k_0} = \{j_0, j_1\}$ and $\{j_0, j_1\} \not\subset \Omega_{i,k}, k \neq k_0$).[2] In the Appendix, we show that the optimal export of product k_0 from country j_0 to country i is

$$x^*_{j_0,i,k_0} = \frac{\phi_{j_1}}{w_{j_1}\tau_{j_1,i}} \left(1 + \frac{\phi_{j_1} w_{j_0} \tau_{j_0,i}}{\phi_{j_0} w_{j_1} \tau_{j_1,i}}\right)^{-2} \alpha_{k_0} Y_i, \tag{2}$$

which is symmetric for country j_1, another exporter of product k_0. One notable observation of Equation (2) is that the quantity of country j_0's export of product k_0 to country i will become higher when country j_0's marginal productivity (ϕ_{j_0}) increases more than country j_1's (ϕ_{j_1}).

We show in the Appendix that the maximized profit for country j_0's exporter of product k_0 to country i is

$$\pi^*_{j_0,i,k_0} = \left(1 + \frac{\phi_{j_1} w_{j_0} \tau_{j_0,i}}{\phi_{j_0} w_{j_1} \tau_{j_1,i}}\right)^{-2} \alpha_{k_0} Y_i. \tag{3}$$

Equation (3) indicates that country j_0's profitability will increase when the marginal productivity of that country increases more than that of its competitors. Therefore, when the productivity of countries other than these two remain constant, a positive shock to the productivity in one country should lead to lower profit for the country it competes with. This implies that when country j_0's stock price is determined by the sum of profits for all firms within that country (i.e., $\sum_{i\in\mathscr{I}} \sum_{k=1}^{\omega} \pi^*_{j_0,i,k}$), a positive productivity shock in one country

[2]We also assume that at least two countries always produce the same variety of products. Additionally, there is a single firm that produces each product within a country.

should lead to lower stock returns in the countries it competes with in common product markets.

The line of reasoning so far suggests that countries competing in common product markets (e.g., countries j_0 and j_1) are likely to have lower stock return correlations. However, the model does not yet reflect how a demand shock in country i (i.e., the common export market of countries j_0 and j_1) would affect the stock prices of both of these exporting countries.

To explore this second "common demand" channel, we examine another product, k_1, for which only countries j_1 and j_2 are the producers. In mathematical terms, for product variety k_1, we assume $\Omega_{i,k_1} = \{j_1, j_2\}$. In this case, although both j_0 and j_2 export to the country i, they are not competing in a common product market because they export different products to country i. Following the same line of reasoning as above, the profitability function for country j_2's exporter of product k_1 to country i is

$$\pi^*_{j_2,i,k_1} = \left(1 + \frac{\phi_{j_1} w_{j_2} \tau_{j_2,i}}{\phi_{j_2} w_{j_1} \tau_{j_1,i}}\right)^{-2} \alpha_{k_1} Y_i. \tag{4}$$

Just as the profitability function for country j_2 is unaffected by the productivity shock in country j_0, the profitability function for country j_0 is unaffected by the productivity shock in country j_2 since these two countries are not competing in a common product market. However, these two countries are exposed to a common demand shock of country i. For example, an increase in the income/wealth of country Y_i would increase the profitability of both countries j_0 and j_2, and therefore their stock returns. Therefore, two countries that produce similar products and compete in a common product market would have relatively low country-level stock return correlation, particularly after controlling for common income shocks in countries in which they compete. In contrast, when two countries share a common export market but produce different products, their stock returns would be more highly correlated.

In this paper, we aim to distinguish these two shock transmission channels, requiring us to develop distinct measures to capture each channel. The first measure reflects product market competition, highlighting the negative effect of a productivity shock in one of the countries (j_0) on the performance of the countries it competes with in common product markets (e.g., j_1). The second measure reflects common demand, aiming to capture how much a common demand shock (Y_i) affects the stock prices of countries serving the same export market in the same direction, particularly if they do not compete in the same product market (e.g., j_0 and j_2).

III. Data

1. Data source

We collect our data from several different sources. The international stock index returns are obtained from the Daily World Indices provided by Wharton Research Data Services (WRDS). The database contains index returns, including dividends, from 36 countries from 1986 onward. Both developed and emerging economies are well covered in this database. From the dataset, we take four indices from North and South America (Brazil, Mexico, Chile, and Colombia), two indices from Oceania (Australia and New Zealand), 10 indices from Asia (China, India, Indonesia, Japan, Malaysia, Philippines, Singapore, South Korea, Thailand, and Turkey), two indices from Africa (Egypt and South Africa), and 18 indices from Europe (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, and United Kingdom).

In addition to the data from Daily World Indices, we obtain additional index returns for two countries – Canada and the US. For the US, we obtain the CRSP daily value-weighted index including dividends, and for Canada, which is excluded from the WRDS dataset, we take the S&P/TSX Composite Index. Among indices covered by the WRDS, we note that we remove Hong Kong from the analysis because firms listed in the Hong Kong Stock Exchange have a strong correlation with China's trade activities, probably even stronger than with Hong Kong's own trade activities. We also exclude the Taiwanese stock market since its data is not available in some of the Trade databases detailed below. Our compiled stock index returns data covers the period between 1996 and 2021.

The value of currency for each of the market is calculated on a daily basis, using daily exchange rates compiled by the International Monetary Fund (IMF) from reports provided by each central bank at the end of the day. For currencies not reported on the IMF website, we obtain them directly from the corresponding central bank websites.

Panel A of Table 1 describes the countries covered, the first year the market index enters the sample, and the average and standard deviations of country stock returns after converting to USD. The stock markets of China, Denmark, India, and the US were those that have had relatively high mean returns, and Greece, Malaysia, Portugal, and Thailand are those that have had relatively low mean returns. The panel also shows that, in the US, the average annualized stock returns during the sample period is 11.2%, which is slightly higher than the historical average typically used in equity market research. Part of the reason is that the sample ends in 2021, at the period when the stock market reached its local peak.

Panel B of the table provides an overview of the cross-continent stock return correlation, calculated by averaging the correlations between pairs of countries by their geographic location. With the exception of Africa and Asia, stock returns are generally highly correlated if two countries belong to the same continent. Interestingly, the average correlation for an Asian country is higher with a country in Australasia than with another country in Asia. This lower intra-Asia correlation could be attributed to the relatively large geographic distance and differences in industry structure between North and South Asia. A further decomposition of Asia into these two regions reveals a correlation of 0.354 between South and

North Asia, while the average correlation between countries in South Asia and Australasia stands at 0.430. For Africa, Egypt has a low correlation with every other country in the sample (< 0.25).

The international stock return database at the firm level is obtained by appending the Compustat Global database to the Compustat North America database. We use the Wharton Research Database Services to retrieve the data between years 1996 and 2021. To compute stock returns, we use the location of firm incorporation (fic) to determine the location of the firm. Since firms incorporated in one location may have a factory outside of their home, the industry level return computed using the fic code may not correspond exactly to those computed using the trade database we describe below.

The trade measures are constructed from two sources. Our first measure captures the product market competition between two countries, constructed using the product-level trade dataset in the BACI database from the Centre d'Etudes Prospectives et d'Informations Internationales (CDPII). This dataset originates from the United Nations (UN) Comtrade dataset provided by the UN Statistics Division. The dataset covers international import and export for more than 200 countries and 5,000 products between 1995 and 2020, at the 6-digit level of the Harmonized Commodity Description and Coding System (HS). The methodology used to compile and clean the data is provided in Gaulier and Zignago (2010). Other trade measures are constructed from the aggregate trade volume. We obtain country-level total exports and imports data from IMF's Direction of Trade Statistics (DOTS) dataset, which provides a breakdown of the annual total of merchandise imports and exports by each counter-party country.

We also use the Inter-country Input-Output (ICIO) table to determine international trade flow at the industry level. The database is obtained from OECD and covers 45 unique industries based on ISIC Revision 4 for 76 unique countries from 1995 to 2020.

IV. Trade and Return Measurement

In this section, we develop several trade-based measures to capture the rich structure of trade linkages. In particular, we propose measures of trade linkages to distinguish the two shock transmission channels described above. The first measure captures product market competition, highlighting the negative effect of a productivity shock in one of the countries on the performance of the competing country. The second measure captures common demand exposure, the extent to which a demand shock in a common export market affects the stock prices of countries serving that market in the same direction.

1. Competition measure

Following Glick and Rose (1999), we first measure product market competition between countries a and b at the individual product level. This measure uses the product-level import and export database provided by the United Nations, as described above. The competition for product p is defined as

$$C_p(a,b) = \sum_{d \in D^{a,b}} w_p(a,d) \left(1 - \frac{|X_p(a,d) - X_p(b,d)|}{X_p(a,d) + X_p(b,d)}\right), \tag{5}$$

where $D^{a,b}$ is the set of all countries in the world excluding a and b, $X_p(a,d)$ is the export of product p from country a to export destination d, and the weight, $w_p(a,d) = \frac{X_p(a,d)}{\sum_{d' \in D^a} X_p(a,d')}$, measures country a's export of product p to country d as a proportion of the export of the same product to the entire world.

There are several things to note from this product-level competition measure. First, the numerator inside the parentheses, $|X_p(a,d) - X_p(b,d)|$, is negatively related to how countries a and b compete in market d. If both a and b export an equal dollar value of product p to a third country, country d, this numerator would be zero, denoting an intense competition between the two exporting countries a and b with both countries having identical market shares of product p in country d. The value in the parentheses is 1 in this context. In contrast, if only one country exports product p to country d, the numerator equals the denominator, and the value in the parentheses is 0, denoting the absence of product market competition.

Second, our competition measure is built from the perspective of the importing market. That is, we count two countries as highly competing if they export similar amounts, not similar fractions, of products to the common market regardless of the size of the country. A relatively much smaller country such as Singapore can compete with a larger country US in a common market on certain products only if they both export the same amount of products to the common market.

Third, this measure is asymmetric between each pair of countries a and b: $C_p(a, b)$ is conceptually different from $C_p(b, a)$. This is because the weight ($w_p(a, d)$) for each product market is defined from the perspective of the first country, i.e., country a for $C_p(a, b)$. The weights are determined by the relative importance of country d as an export destination for a only, completely ignoring the importance of country d to b. The measure is designed so that if countries a and d do not trade much with each other, competition in d's market would not affect country a's competitive position even if countries b and d trade intensively. This asymmetry is relevant if the two focal countries a and b substantially differ in their respective sizes.

Aggregating from the product level, we define the industry-level competition between a and b

$$IndComp_{ind,a,b} = \sum_{\forall p \in ind} \frac{X_p(i)}{X_{ind}(i)} C_p(a, b), \tag{6}$$

where $C_p(i,j)$ is defined as in Equation (5), $X_p(i)$ is the amount of export of product p of country i, and $X_{ind}(i)$ is the amount of export of all products that belong to industry ind for country i, where the HS product codes are matched to the 45 industries of ICIO as in Pierce and Schott (2012).

Similarly, the degree of competition between countries a and b at the country level is the average of the product-level competition, weighted by the amount of export of country a of the product:

$$Comp_{a,b} = \sum_{\forall p} \frac{X_p(a)}{X(a)} C_p(a,b), \tag{7}$$

where $X_p(a)$ is a's total export of product p ($= \sum_{\forall d \neq a} X_p(a,d)$) and $X(a)$ is the total export of country a of all products ($= \sum_{\forall p} X_p(a)$). The country-level competition measure is also asymmetric, partly because the product-level competition measure is asymmetric and also because the product-level measure is weighted by the trade volume from country a's perspective.

Figure 1 illustrates the time-series patterns of international stock return correlations and international trade. For illustrative purposes, the stock return correlations are computed by taking its three-year moving average of years (t, t-1, and t-2). Panel (a) shows the relationship between the stock return correlation (scale on the right) with the relative importance of international trade in the economy, calculated as the sum of exports and imports divided by GDP (scale on the left). Panel (b) replaces the latter with the trade-based competition measure, which we inverted in this panel so that, a priori, we expect both measures to have a positive relationship with cross-country stock return correlations.

Panel (a) confirms that higher international trade volumes are associated with higher stock return correlations before the global financial crisis (2008) period. The relationship seems to have evolved in the post-crisis period, with trade volumes continuing to grow but the stock return correlation declining before bouncing back after around 2018. Excluding the last few years of the sample that are affected by the COVID-19 pandemic, the correlation seems to have decreased despite the continuous development of international trade.

Panel (b) indicates that during the post-crisis period, notably starting from 2015, global competition has significantly intensified. As competition intensifies, the model predicts a decrease in the correlation between stock returns. We observe a consistent pattern in the data, i.e., the decrease in the correlation observed for the post-crisis period. Although the stock return correlations appear to have decreased somewhat before competition increased, this pattern may be attributed to the stock market incorporating shocks to future expectations alongside current cash flow shocks.

The patterns in Figure 1, particularly in Panel (b), provide prima facie evidence consistent with our hypothesis. In addition to confirming the relatively stagnant cross-market correlations in recent years, as highlighted in previous works by Bekaert, Hodrick, and Zhang (2009) and Bekaert, Ehrmann, Fratzcher, and Mehl (2014), these patterns also highlight the potential of our competition channel in reconciling the divergence between the increasing importance of global trades and the relatively stable stock return correlations over the last 15 years.

Panel C of Table 1 presents the average competition categorized by continent. Similar to Panel B, it demonstrates that countries exhibit a higher degree of competition measures with geographically proximate countries. This proximity often exposes them to similar demand shocks, resulting in a positive correlation in stock returns.

Figure 2 illustrates the competition measure among pairs of countries. Due to the measure's asymmetry, one can interpret the data relative to the country displayed on the vertical axis. For instance, the US exhibits significant competition with Germany and the UK. Germany, on the other hand, competes considerably with Belgium, France, Italy, the Netherlands, Canada, and Japan, but less so with the US. Canada engages in competition with Mexico but to a lesser extent with Germany. Given the proximity of nations with high degrees of competition measure, it becomes imperative to control for additional trade variables, especially those that capture the extent to which the two countries are exposed to a common demand shock.

2. Common demand measure

In the empirical analysis, we capture common demand shocks using two related methods. First, we employ a trade-based common demand (CD) measure. This measure is conceptually connected to the product market competition measure as two countries with a high degree of competition would export to similar markets and should be exposed to common demand risk emanating from those markets. The key difference is that the competition measure is constructed using disaggregated information at the product level, whereas the CD measure is calculated using the aggregated trade flows.

To compute the CD measure, we obtain country-level total exports and imports data from the IMF Direction of Trade Statistics (DOTS), which provides a breakdown of the annual total of merchandise imports and exports by each counter-party country. Then, the CD of country a with respect to country b is defined as

$$CD(a,b) = \sum_{d \neq b} f(a,d) \left(1 - \frac{|f(a,d) - f(b,d)|}{f(a,d) + f(b,d)}\right), \tag{8}$$

where $f(a,d)$ is the fraction of country's a's total export that is exported to country d, which is calculated as the amount of export from country a to d $(X(a,d))$ divided by the total export of country a to the entire world $(X(a) = \sum_{\forall d \neq a} X(a,d))$.

The CD measure resembles the competition measure in Equation (7), with two crucial differences. First, as also emphasized above, the competition measure is calculated from individual product-level data, which is then aggregated to the country level, whereas the CD measure is computed from the aggregated trade data. If two countries export different products to a common market d, their CD measure will reflect their shared exposure to demand shocks of country d, but the competition measure would underline the lack of product market competition between the two countries. Second, instead of calculating the dollar amount of export difference as in the competition measure ($|X_p(a, d) - X_p(b, d)|$), the CD measure uses the difference between the respective *fraction* of the amount exported to the common market by each of the two countries ($|f(a, d) - f(b, d)|$). Therefore, the CD measure will be higher when two countries have similar compositions of export destinations.

The motivation for using the dollar amount of export for the competition measure and the fraction of export for the CD measure is easier to illustrate for two countries with differing sizes. A small country (S) and a large country (L) will compete intensely in a product market (d) only if these two countries have similar market shares in that market ($X_p(S, d) \approx X_p(L, d)$) despite their different sizes. These market shares are reflected in the dollar amount of exports from each country.

However, a common demand shock could affect the two countries regardless of the different sizes of their economies (or their total exports). Countries that rely heavily on a single export destination, e.g., the US for Mexico and Canada, would have a large fraction of their exports tied to the US and would be substantially affected by US demand shocks despite the substantial difference in the economy sizes of the two countries, Mexico and Canada. This means that the fraction of each country's export that goes to the US is the relevant input to the measure of exposure to common US demand shock.

Figure 3 illustrates the common demand share among pairs of countries. One can see that this figure resembles that of Figure 2. In particular, a European country generally competes with another European country, and they are also exposed to the same demand shocks. However, there are also several notable differences. For example, Canada and Mexico are exposed to the same source of demand shock, but they are not competing in the product market. Australia is not competing with New Zealand in the product market, but they are exposed to a common demand shock. Japan competes with Germany, but they are not exposed to a common demand shock.

We employ a second common demand measure that captures the demand shocks to common export markets between two countries a and b as reflected in the country-level stock market returns of the common markets of these two countries. Each of these country-level stock returns is weighted by the corresponding component of Equation (8), which makes up the common demand trade measure. That is, the *common demand return* measure is defined as:

$$R_{CD,t}(a,b) = \sum_{d \neq b} f(a,d) \left(1 - \frac{|f(a,d) - f(b,d)|}{f(a,d) + f(b,d)} \right) R_{d,t}, \tag{9}$$

where $f(a,d)$ is defined as above, and $R_{d,t}$ is the return of country d. We use this second common demand measure to control for the common global component of stock returns that may affect both countries a and b.

3. Additional trade measures

The measures we described in the previous two subsections consider two countries' linkages with a third country as a common export destination. Stock market correlations could also be affected by the direct trade relationship between the two countries as well as the characteristics of each country. This section introduces additional trade measures that are used as control variables in the empirical study. While these measures are not directly derived from our simple model, they are potential factors that could influence stock market comovements.

We define an export share ($ExpShare$) measure to capture the extent of one country's reliance on a second country as an export destination in cross-border trade. Using the DOTS data, we define direct trade, $ExpShare_{a,b}$ of country a to b as the log difference between the export of country a to b ($X(a,b)$) and the total export of country a to the entire world ($X(a) = \sum_{\forall d} X(a,d)$). We expect this measure to have a positive influence on stock return correlation. If a significant fraction of country a's exports flow to country b, then any demand shock that originates from country b should affect country a. As such, this measure is also useful for capturing the economic proximity between the two countries.

We also measure the share of exports ($FracExp$) of a country's aggregate economic activities. We measure this by taking the log difference between a country's total export ($X(a)$) and its total GDP. All else equal, we expect countries with a higher export share of GDP to be influenced more by the global economy compared to countries that have a relatively larger domestic market and export less to the rest of the world.

We also develop a common supply measure to capture the potential shared exposures to supply shocks. Similar to the common demand measure, the common supply measure ($ComSup_{a,b}$) is defined as

$$ComSup_{a,b} = \sum_{s \neq b} g(s,a) \left(1 - \frac{|g(s,a) - g(s,b)|}{g(s,a) + g(s,b)} \right), \tag{10}$$

where $g(s,a)$ is the fraction of country a's total import from country s, calculated as the amount of import of country a from country s divided by the total import of country a.

Finally, we measure the import share of country a with respect to country b ($ImpShare_{a,b}$) as the log difference between the country a's import from b ($X(b,a)$) and the total import of country a from the entire world ($\sum_{\forall d} X(d,a)$).

4. Industry returns

In the subsequent section, we conduct some analyses at the industry level, utilizing the 45 industries identified in the ICIO table. We first compute the value-weighted industry returns within each country using all firms incorporated in that country that belong to a particular industry.

We also compute the downstream and upstream returns for a particular country-industry. We utilize the ICIO table to gauge the volume of exports from each country-industry to another country-industry. The industry returns of the importing sectors are then weighted by volume to define the downstream industry return for each country-industry. Similarly, the upstream industry return for a country-industry is determined by the industries from which it obtains its resources, with returns again weighted by volume as per the ICIO table.

In our empirical analysis, we use the excess country-industry returns, which is defined as the country-industry return in excess of the global value-weighted industry return. Similarly, the excess upstream return is computed from excess country-industry returns instead of raw country-industry returns. Consequently, the excess upstream return serves to control for the global industry effect of upstream firms.

V. Empirical Results

In this section, we analyze how the degree of product market competition between two countries relates to the comovement of their stock markets. We begin our analysis at the country level and then analyze product market competition and stock return relationship at the country-industry level.

1. Global competition and stock market returns

We first provide a direct test of the model to examine whether increased product market competition between two countries results in reduced stock market comovement, particularly after controlling for common demand exposure. Our model indicates that when two countries produce the same product and export goods to a shared destination, their stock markets are less likely to move in similar directions, especially with supply-driven shocks such as technological innovations or disruptions in the supply chain involving one of the countries.

We test this hypothesis by considering the entire global panel using stock returns aggregated at the country level. We apply a two-step procedure using weekly returns, computed by taking the sum of log daily returns over five days. First, we perform the following first-stage regression:

$$R_{i,t} = \alpha_{i,j} + \beta_{i,j} R_{j,t} + \gamma_{i,j,D} R_{CD,t}(i,j) + \gamma_{i,j,q} \Delta q_{i,j,t} + \epsilon_{i,j,t}, \tag{11}$$

where $R_{i,t}$ is the stock returns of country i, $R_{CD,t}(i,j)$ is the common demand weighted global stock return for country-pair i and j, and $\Delta q_{i,j,t}$ is the currency return of country i relative to country j. A higher $q_{i,j,t}$ implies a currency appreciation for country i relative to country j. We estimate the regression annually for each pair of countries using weekly data that belongs to that particular year. We first estimate the regression using local currency returns, and then estimate using stock returns converted in terms of USD and setting $\gamma_{i,j,q} = 0$.

Second, we study whether $\hat{\beta}_{i,j}$ can be explained by the trade measures we consider as our primary interest is how shocks to country j reflected in its stock index returns are related to country i's index returns. In particular, the second-stage panel regression that we implement is as follows:

$$
\begin{aligned}
\hat{\beta}_{i,j,y} = & \delta_1 Comp_{i,j,y-1} + \delta_2 CD_{i,j,y-1} \\
& + \delta_3 ExpShare_{i,j,y-1} + \delta_4 FracExp_{i,y-1} + \delta_5 ComSup_{i,j,y-1} + \delta_6 ImpShare_{i,j,y-1} \\
& + \text{Time FE}_y + \text{Country FE}_{i,j} + e_{i,j,y}.
\end{aligned} \tag{12}
$$

We consider using weekly frequency for stock returns to be optimal in testing our hypothesis. Literature on financial econometrics shows that, in the absence of micro-structure noise, the accuracy of variance and covariance estimation can be improved by using high-frequency returns.[3] However, using a higher frequency than the weekly horizon leads to potential measurement issues associated with asynchronous trading hours due to the spherical shape of the Earth.

The two-step procedure is employed for a related reason. While financial data is available at a relatively higher frequency, our trade variables are measured at the annual frequency. In this specification, the variation in low-frequency trade variables is used to explain estimates obtained from high-frequency variables. This approach is common in financial economics and macro-finance literature. Fama and MacBeth (1973) adopt a two-stage regression approach to explain the variation in the cross-section of market beta-sorted portfolios. Jurado, Ludvigson, and Ng (2015) use separately estimated stock market volatility using higher frequency data to test the relationship to uncertainty measures. David and Veronesi (2014) test the relationship between the stock-bond correlation, estimated using daily data, and other macroeconomic variables.

[3]See, for example, Andersen, Bollerslev, Diebold, and Labys (2001). Barndorff-Nielsen and Shephard (2002), Andersen, Bollerslev, Diebold, and Labys (2003), Hansen and Lunde (2006), among others.

It is well-known that an error-in-variable bias arises when we use a noisy estimate as an explanatory variable. Since the potentially noisy estimate of $\hat{\beta}_{i,j,y}$ appears as the dependent variable in the second stage regression, our analysis differs from a typical Fama-Macbeth regression that may be subject to error-in-variable bias. The estimation error in the first stage does not generate a bias in our second-stage estimator, although our standard error might be biased upwards (not downwards) from the estimation error, which would bias against us finding statistically significant estimates for the trading-based measures.

The second-stage panel regression also includes country-pair fixed effects, which should absorb any (time-invariant) cross-sectional variation in stock market comovement, leaving only the time-series component to be explained by the trade measures. That is, the hypothesis we test is whether a higher competition in one year between two countries i and j is followed by a lower comovement of stock prices between these two countries the following year.

Table 2 summarizes the results of the second-stage panel regression. The left-hand side of the regression presents the results when returns in the first stage are denominated in USD, while the right-hand side shows the results when returns are in local currency. For each first-stage regression, we consider four different specifications in the second-stage panel regression, incorporating additional variables as control variables. It is important to note that we also control for common demand returns in the first stage.

Overall, across all specifications, we observe a strong negative effect of product market competition on country stock market return comovement. This finding aligns with our model and hypothesis, indicating that countries experiencing higher competition in a common market tend to exhibit lower stock market comovement.

We observe a positive sign on the common demand measure when returns are expressed in USD. We also observe a similar positive effect for local returns, but it is not statistically significant. This result could suggest that the common demand return at the market level might be an insufficient control, or it could imply that currency returns tend to move together with greater exposure to common demand. Additionally, we find a positive effect of export share, which may be associated with the geographic distance between the two countries.

2. International industry-level competition and return comovement

The previous section provides evidence that heightened competition among countries is associated with a lower comovement in their stock prices. This section provides a more granular analysis at the country-industry level. This analysis also offers a generalization of our initial analysis from country-level stock returns to cross-country industry-level returns.

We examine whether an industry's stock prices in one country comove less with the prices of the *same* industry in another country if these country-industries compete more heavily in their common product markets. This hypothesis is tested using ICIO's classification of 45 industries. We implement a two-stage estimation process analogous to our main analysis that is modified to fit the industry-based nature of the current analysis. The first-stage regression is

$$\begin{aligned}\tilde{R}_{ind,i,t} =& \alpha_{ind,i,j} + \beta_{ind,i,j}\tilde{R}_{ind,j,t} + \gamma_{ind,i,j,1}R_{ind,i,D,t} + \gamma_{ind,i,j,2}R_{ind,j,D,t} \\ &+ \gamma_{ind,i,j,3}\Delta q_{i,t} + \gamma_{ind,i,j,4}\Delta q_{j,t} + \epsilon_{i,j,ind,t},\end{aligned} \tag{13}$$

where $\tilde{R}_{ind,i,t}$ is the stock return of industry *ind* in country i in excess of the global value-weighted industry *ind* return as described above, $R_{ind,i,D,t}$ is the downstream industry raw return of industry *ind* of country i, $R_{ind,j,D,t}$ is the downstream industry raw return of industry *ind* of country j, $\Delta q_{i,t}$ is the currency return of country i relative to USD, and $\Delta q_{j,t}$ is the currency return of country j relative to USD. Similar to the main analysis, we first consider returns denominated local currency and then estimate the regression using USD-converted returns after setting $\gamma_{ind,i,j,3} = \gamma_{ind,i,j,4} = 0$.

We first note that the regression specification controls for the downstream returns for industry *ind* for both countries i and j. These controls follow from the intuition that a demand shock on the products supplied by industry *ind* in both countries would lead to a positive comovement in stock returns. Hence, we use the downstream return of the two countries to account for the demand shock experienced by competing producers in these countries. Including these country-industry variables measuring downstream returns provides the country-industry-specific version of the common demand measure that we employ in our baseline non-industry-specific analysis.

This industry-level specification employs the industry returns of a country in excess of the corresponding global industry returns, allowing us to control for global demand shocks faced by all producers in industry *ind*, irrespective of the level of product market competition they face. We obtain a similar result when we control for global industry returns in the first stage, instead.

We hypothesize that fierce competition between two countries at the industry level attenuates the comovement of stock returns in the same industry between the two countries. If this hypothesis is valid, we expect $\beta_{ind,i,j,y}$ to be lower for countries with high industry-level competition. In other words, we expect b to be negative in the second-stage panel regression given by

$$\hat{\beta}_{ind,i,j,y} = a + b\, IndComp_{ind,i,j,y-1} + FE_{i,j} + FE_y + e_{i,j,ind,y}, \tag{14}$$

where $\hat{\beta}_{ind,i,j,y}$ is the estimated sensitivity of industry *ind*'s return in country i to the return of the same industry in country j in year y, $IndComp_{ind,i,j,y-1}$ is the industry competition measure for industry *ind* computed between countries i and j in year $y-1$.

Table 3 summarizes the results of this second-stage panel regression with several specifications, where each column differs by the types of country-fixed effects used: country i, country j, and/or country pair (i, j). Panel A reports the estimates for b using local currency returns, whereas Panel B uses USD-converted returns in the first-stage regression. For all combinations of fixed effects and currency denominations considered, we find support for our hypothesis that cross-country competition in product markets has a statistically significant negative effect on stock market correlations. The stock prices in an industry in one country are less likely to move together with the stock prices in the same industry in a different country if these two countries compete more intensely in the common product markets of the industry. In sum, the analysis in this section supports the main hypothesis that product market competition leads to a lower comovement between country stock returns.

3. The source of the negative effect of competition on comovement

For two firms located in two different countries that compete in a specific industry, the model suggests that the stock prices of these two firms would move together in response to a demand shock. On the other hand, a productivity shock that affects the supply chains of only one of the firms would lead to a negative comovement in the stock prices of these two firms.

In this section, we further examine what drives the negative relationship between product market competition and industry return comovement. Specifically, we study whether shocks in the supply chain of a firm in one country have the opposite influence on the firm in another country that is competing with the first firm.

This hypothesis is tested by modifying the first-stage regression of Equation (13):

$$\begin{aligned}\tilde{R}_{ind,i,t} =& \alpha_{ind,i,j} + \beta_{ind,i,j,U}\tilde{R}_{ind,j,U,t} + \gamma_{ind,i,j,0}\tilde{R}_{ind,i,U,t} + \gamma_{ind,i,j,1}R_{ind,i,D,t} + \gamma_{ind,i,j,2}R_{ind,j,D,t} \\ &+ \gamma_{ind,i,j,3}\Delta q_{i,t} + \gamma_{ind,i,j,4}\Delta q_{j,t} + \epsilon_{i,j,ind,t}, \end{aligned} \tag{15}$$

where $\tilde{R}_{ind,j,U,t}$ is the weighted average excess returns of upstream industries of industry ind in country j and $\tilde{R}_{ind,i,U,t}$ is the weighted average excess returns of upstream industries of industry ind in country i. The other variables, including the downstream return variables, are identical to those defined in Equation (13). Therefore, the primary difference between the first-stage regressions in this analysis and the previous one lies in the replacement of the industry excess returns of the competing country with the industry's upstream excess returns in both the focal country i and the competing country j.

Our hypothesis posits a negative relationship between the industry returns of two countries engaged in competition within the same industry, driven by supply chain shocks. If this hypothesis holds true, we anticipate that industry returns of the focal country would exhibit a more negative response to shocks in the upstream industry of the competing country when the two countries compete more intensely. Thus, by controlling for both the upstream returns of the focal country as well as the downstream returns of both countries, the industry return of the focal country should demonstrate a weaker reaction to the upstream returns of the competing country.

We formally test this supply chain channel in the second-stage regression, identical to the one (14) employed in the previous analysis. The dependent variable is now the beta on the upstream industry return of the competing country estimated from the first stage, i.e. $\hat{\beta}_{ind,i,j,U}$. The results of the second-stage panel regression are presented in Table 4. Once again, Panel A displays the outcomes when the first-stage regression is estimated using local returns, while Panel B reports the results with returns expressed in USD, with currency betas set to 0. Each column in both panels corresponds to different types of fixed effects.

Across all columns, we observe a consistent negative effect of the upstream returns of the competing country on the industry returns of the focal country, particularly in cases where the two countries engage in high competition within the industry. These findings align with the model's mechanism, indicating that supply-driven shocks contribute to negative stock return comovement between competing countries.

4. Do competing countries have similar demand shocks?

Our industry-level competition measure is constructed at the product level and measures how industries in two distinct countries compete in common product markets. In the model, supply shocks in a particular industry of one country should affect the same industry in a competing country in the opposite direction. In contrast, demand shocks affecting one country should affect the competing country in the same direction.

While the analysis in the preceding subsection explores supply-driven shocks (and documents evidence consistent with the supply chain channel), we devote this subsection to exploring the channel through which demand shocks affecting an industry in the focal country also positively affect the same industry in another country with whom the focal country competes intensely in their common product markets. This deeper exploration of the demand channel would also be useful in validating the downstream-upstream industry return breakdown as well as the (industry) competition measure that we employ in previous analyses.

We posit that the downstream channel of a focal industry of the competing country would be similar to the downstream channel of the focal country-industry if these two country-industries compete intensely in the product markets. This implies that the returns of the downstream channel (i.e., downstream industry returns) of the competing country will be more positively related to the focal country-industry return when the degree of product market competition is higher.

We test this hypothesis using the following first-stage regression:

$$\tilde{R}_{ind,i,t} = \alpha_{ind,i,j} + \beta_{ind,i,j}\tilde{R}_{ind,j,t} + \gamma_{ind,i,j,2}R_{ind,j,D,t} + \gamma_{ind,i,j,3}\Delta q_{i,t} + \gamma_{ind,i,j,4}\Delta q_{j,t} + \epsilon_{i,j,ind,t}, \tag{16}$$

where all variables are the same as those defined in Equation (13). The only difference between this regression and equation (13) is that we no longer control for the focal country-industry's downstream industry return ($R_{ind,i,D,t}$) because we would like to test whether the downstream industry of the competing country-industry is more similar to the focal country-industry's downstream industry when the two countries compete intensely in the focal industry.

The second-stage regression is also similar to the previous analysis, but the dependent variable is now the estimate of $\hat{\gamma}_{ind,i,j,2}$, i.e., the downstream beta reflecting the co-movement between the focal country-industry's return and the competing country's *downstream* industry return. We expect this estimate to be positively correlated with product market competition, in contrast to the negative correlation we documented earlier for the competing country's industry beta.

Table 5 presents the results of the panel regression. Panel A displays the outcomes when the first-stage regression is estimated using local currency returns, while Panel B reports the results with returns expressed in USD. As anticipated, both panels indicate a positive effect of industry competition on the downstream beta of the returns of competing countries. All coefficients are positive, with nearly all statistically significant, indicating that competing countries tend to face similar demand shocks as well as validating the product market competition measure utilized in previous analyses.

5. Cash flow shock vs Discount rate shock

Lastly, we conduct a set of analyses with the US as the focal country for two reasons. First, the US hosts a substantial fraction of global market capitalization and a large fraction of the equity investor base who will benefit from a specific analysis of how export competition affects stock correlations and ultimately portfolio diversification. Second, the analyses offer us an opportunity to perform a supplementary test on whether the reduced comovement between highly competitive countries is driven by cash flow shocks vis-a-vis discount rate shocks. Employing the US as the focal country serves this purpose well as the discount rate measures we utilize are likely to be noisier for other countries whose capital markets are less developed.

To set the stage, we will first replicate the global analysis of competition using the US as the focal country. After verifying that the competition effect also exists in this context, we then explore the cash flow and discount rate shock decomposition using this setting.

For the verification analysis, we employ the following first-stage regression specification:

$$R_{i,t} = \alpha_i + \beta_{i,US} R_{US,t} + \epsilon_{i,t}, \tag{17}$$

where $R_{i,t}$ is the stock return of country i denominated in USD, $R_{US,t}$ is the value-weighted CRSP returns. Note that the independent variable of interest here is the US returns, and therefore, we focus on the US return betas ($\hat{\beta}_{i,US,y}$) estimated for each year y in the second-stage regression for this analysis. Thus, the second stage is the panel regression, where the annual US return betas are regressed on the lagged competition measure from year $(y-1)$ and various control variables. The regression is given by

$$\hat{\beta}_{i,US,y} = \delta_0 + \delta_1 Comp_{i,US,y-1} + \mathbf{c}'\mathbf{Control}_{y-1} + \text{Year FE}_y + e_{i,y}, \tag{18}$$

where **Control** is a vector of variables including $CD_{i,US}$, $ExpShare_{i,US}$, $FracExp_i$, $CS_{i,US}$, and $ImpShare_{i,US}$.

The output of the panel regressions that include all non-US country i and year y are reported in Table 6. Following the analyses in the preceding subsections, we perform the exercise using both weekly and monthly returns. As will become apparent soon, employing monthly returns is beneficial in this context because the discount rate measures that we employ are captured at a lower frequency. The left-hand side of Table 6 reports the results using weekly returns, and the right-hand side reports those using monthly returns.

Overall, we consistently observe a robust negative relationship between stock market comovement and the competition measure in these panel regressions. The coefficients are strongly negative and statistically significant. These findings verify that the conclusions drawn from our analysis at the global level also hold when using the US as a focal country. Additionally, they imply that US investors can potentially reduce the variance of their equity portfolio by investing in countries that exhibit high levels of competition with the US.

After verifying the competition effect with the US as the focal country, we next employ this setting to explore whether the effect is mainly driven by cash flow shocks. Our theoretical model implies that cash flow shocks (instead of discount rate shocks) would be the main driver of the lower comovement between countries that are highly competing. Ideally, we want a perfect decomposition between cash flow and discount rate shocks, but measuring cash flow shocks is difficult. At best, cash flow shocks should be measured at the annual frequency due to cash flow seasonality, resulting in a common knowledge that measures of cash flow shocks are likely to be very noisy.[4]

We instead focus on discount rate shocks and attribute to cash flow shocks the remaining variation in stock returns after taking discount rate shocks into account. We employ three distinct proxies of discount rate shocks. First is the price-dividend ratio. The decomposition of Campbell and Shiller (1988) implies that the innovation of the price-to-dividend ratio can be approximated to a linear function of the discount rate and cash flow growth. With Cochrane (2008) suggesting that the price-to-dividend ratio is unlikely to be related to future cash flow growth and instead predicts future stock returns, we use the innovations in the price-to-dividend ratio as a proxy for discount rate shocks. Second, variance risk premium, defined as the difference between option-implied and the realized variance of the S&P 500 Index. Bollerslev, Tauchen, and Zhou (2009) and Pyun (2019), among others show that this risk premium is useful to predict future stock returns. With this measure reflecting risk premium, it is natural to expect that its innovations would be related to discount rate shocks. Third, we consider the term premium (Campbell 1987), which has been consistently considered as a proxy for discount rate as in Campbell and Vuolteenaho (2004) despite the relatively weak empirical evidence regarding its relationship with future stock returns.

As a first-stage regression, we consider the specification

$$R_{i,t} = \alpha_i + \beta_{i,m} R_{US,t} + \gamma_{i,pred} \Delta Pred_t + \epsilon_{i,t}, \tag{19}$$

where R_i is the stock return of country i, $R_{US,t}$ is the US stock return, of which both are denominated in USD, and $\Delta Pred_t$ is the first-order difference in one of the three measures proposed above for the US. We estimate this first-stage regression using monthly returns as the predictive measures are difficult to measure at a higher frequency even in the US

[4]See, for example, Breeden, Gibbons, and Litzenberger (1989), Parker and Julliard (2005), and Jagannathan and Wang (2007), among others.

context. This first-stage regression relies on the assumption that the three predictors serve as reasonable proxies for discount rate shocks, and therefore the remaining variation in US market returns can be interpreted as related to cash flow shocks. This assumption requires a caveat that the decomposition may be inaccurate if the three measures proposed above are (highly) imperfect proxies for discount rate shocks.

The second stage is a panel regression of

$$Slope_{i,US,y} = \delta_0 + \delta_1 Comp_{i,US,y-1} + \mathbf{c}'\mathbf{Control}_{y-1} + \text{Year FE}_y + e_{i,y}, \tag{20}$$

where $Slope_{i,US}$ is one of the two slopes estimated from the first-stage regression, and control variables are identical to those employed in (18). Table 7 presents the result of this second-stage panel regression. Panel A summarizes the outcomes when the second-stage dependent variable is the US return beta, while Panel B is when the dependent variable is the slope on the discount rate proxies. The results in this table provide strong support for the notion that cash flow shocks in the US drive the weaker commitment between the stock returns of the US and another country with which the US engages in intense product market competition.

Focusing on Panel A, the product market competition measure has a negative beta on the US return beta. Since we control for US discount rate shocks in the first stage regression, this return beta reflects a country's stock market exposure to US cash flow shocks. Hence, the result suggests that US cash flow shocks negatively affect the stock returns of competing countries.

On the other hand, examining Panel B, product market competition shows no effect on the US discount rate beta. This result, when combined with Panel A, suggests that it is cash flow news that drives the lower comovement between the US and its competing country's stock returns. In sum, the findings in this last analysis underscore the differential impact of cash flow shocks and discount rate shocks on stock returns, with cash flow news being the primary driver of the lower comovement between the competing countries' stock returns.

VI. Conclusion

This paper examines the potentially ambiguous effect of trade competition on equity market comovement. We develop a framework to distinguish the product market competition aspect of trade linkages from the common demand exposures. After quantifying the product market competition between two countries in their common export markets, we examine its effect on international equity return dynamics. We find that the product market competition channel has a negative effect on cross-market return correlation: equity markets of countries that compete more with one country in the product market tend to have a lower correlation with the focal stock market.

Our finding that product market competition has a negative effect on cross-country stock comovement is novel to the literature. The conflicting effects of common demand exposure and product market competition dimensions of trade linkages that we document indicate that the increasingly integrated trade network across the globe does not necessarily lead to increasingly higher cross-market correlations among asset returns. Similarly, our findings indicate that the specter of trade wars and pandemic-stricken supply chains do not necessarily herald lower equity market comovement. Understanding how these correlations vary with the contours of the global trade network is crucial for investors seeking diversification in foreign equity markets.

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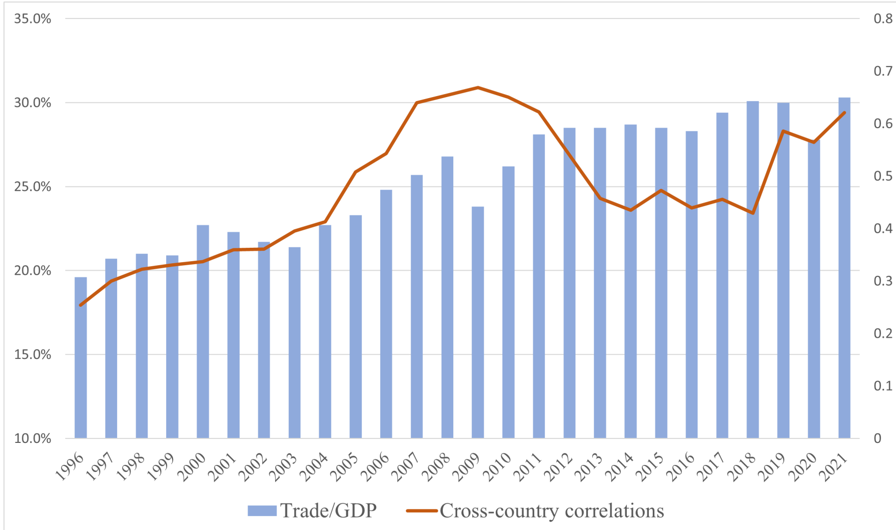
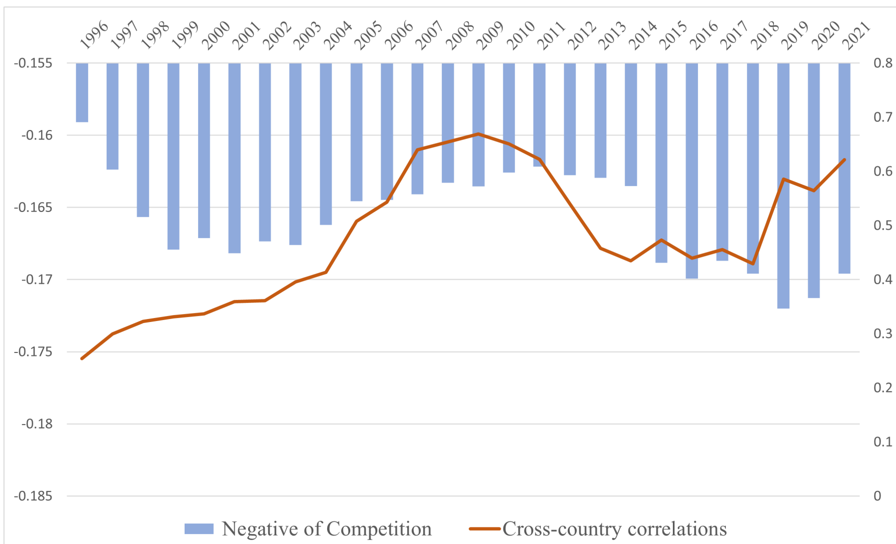


(a) Stock return correlation and trade per gdp



(b) Stock return correlation and trade competition

Figure 1: Time-series of Trade and correlation of stock returns

This figure shows the time-series relationship of the average cross-country stock return correlation for country pairs for the sample considered in this paper (a) to the world average fraction of global trade as a fraction of total GDP for OECD countries and (b) to the negative of the cross-sectional average of the competition measure. Stock return correlations are the three-year moving averages of the yearly estimates.

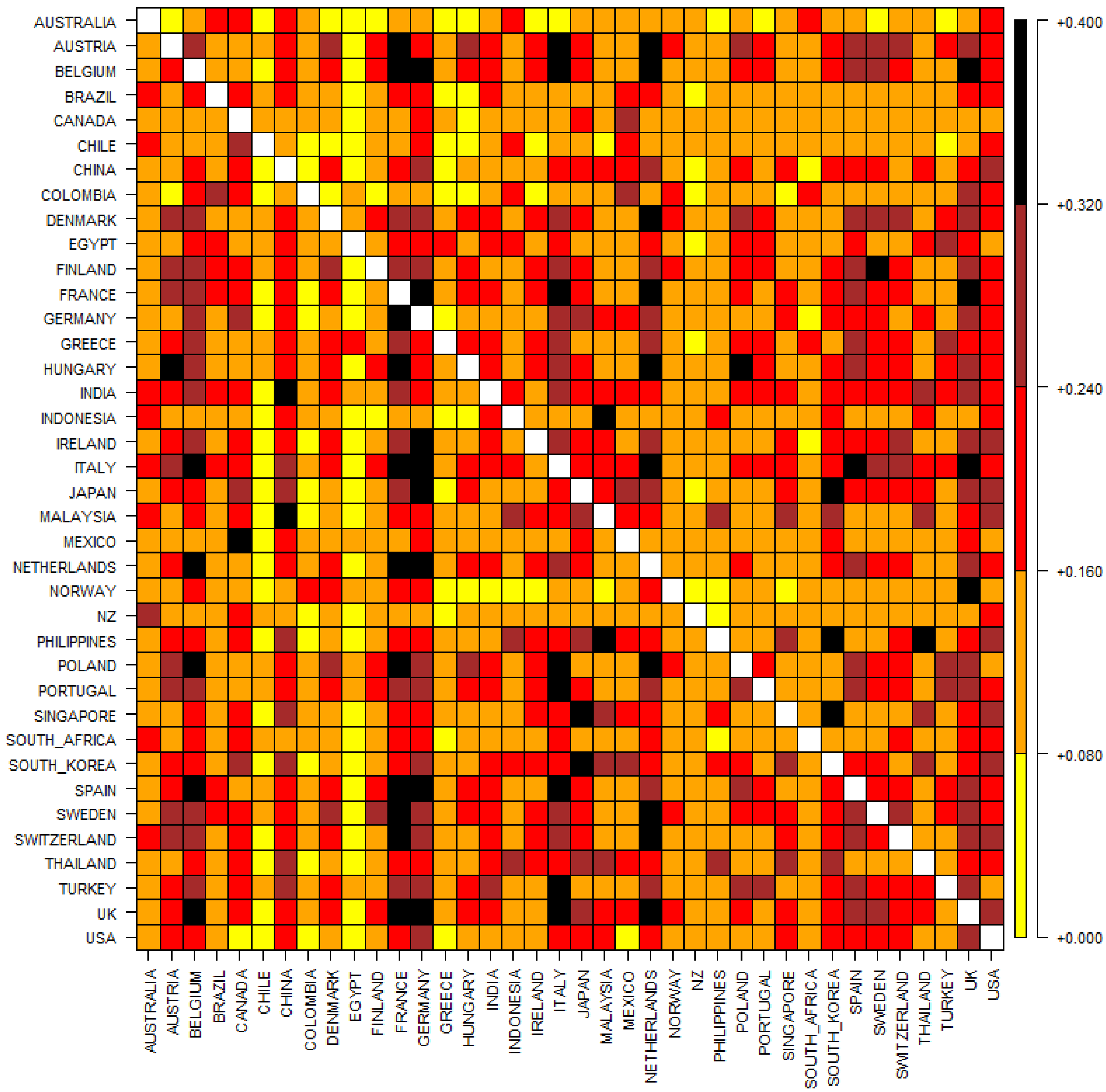


Figure 2: Trade competition across countries

This figure shows the degree of product market competition between two countries. The competition measure shows the extent two countries export the same product to a common destination. The figure depicts the level of competition with another country on the horizontal axis from the perspective of a country on the vertical axis. A darker color demonstrates a higher degree of competition.

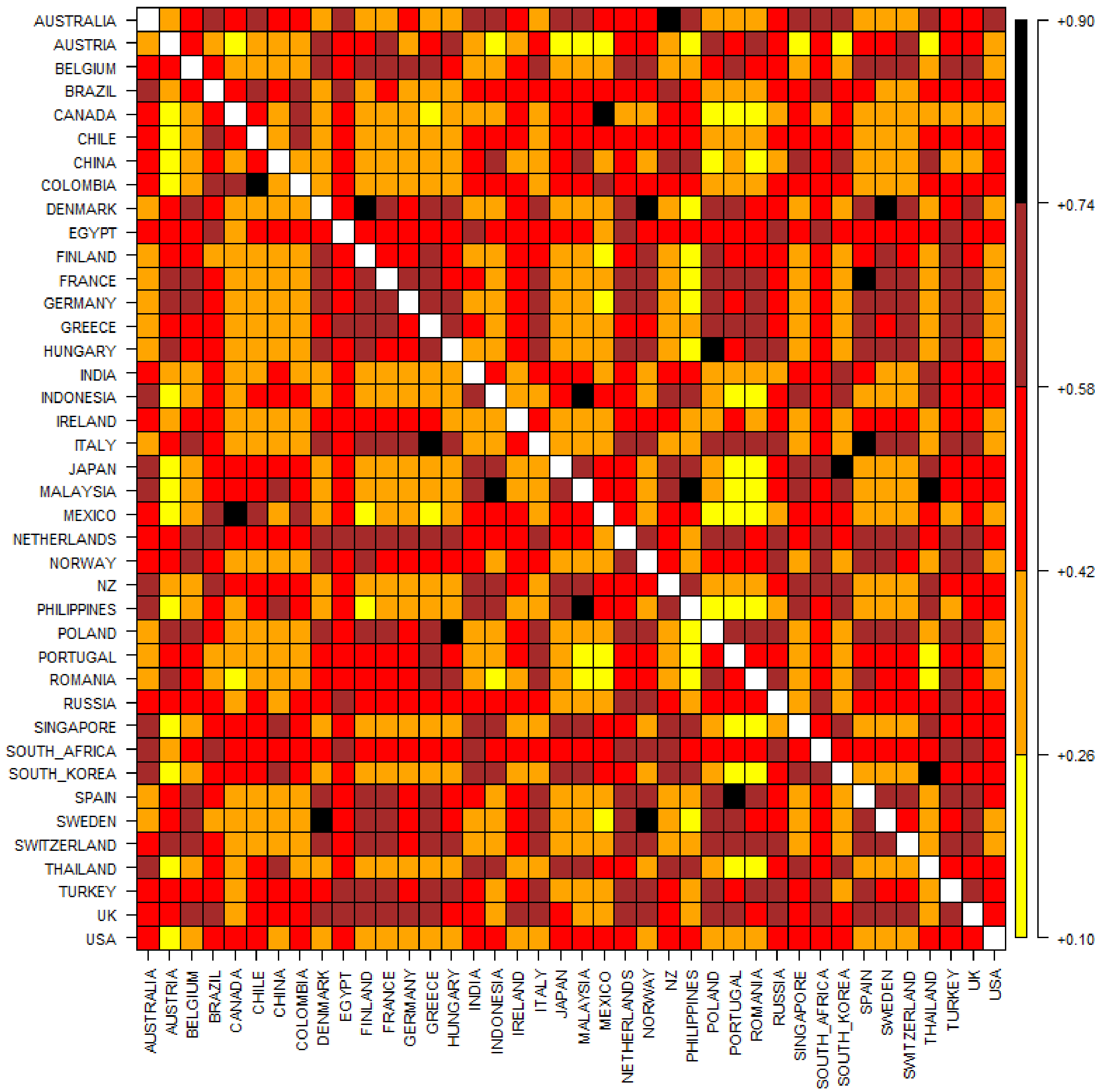


Figure 3: Common demand shared across countries

This figure shows the degree of common demand shared by two countries. The figure depicts the level of common demand shared with another country on the horizontal axis from the perspective of a country on the vertical axis. A darker color demonstrates a higher degree of common demand share.

Table 1
Summary Statistics

This table provides the summary statistics of the data used in the empirical analysis. The average of stock returns converted in terms of USD and their standard deviations are summarized in Panel A. Panel B shows a matrix of the average of correlations between two arbitrary countries grouped by their geographical location. Panel C describes a matrix of the average of the time-series average competition measure of two country pairs grouped by their geographical location.

Panel A. Summary statistics

Country	Year	Mean	Stdev.	Country	Year	Mean	Stdev.	Country	Year	Mean	Stdev.
Australia	1996	0.057	0.218	Germany	1999	0.049	0.214	Philippines	1996	0.034	0.244
Austria	1999	0.073	0.236	Greece	1999	−0.031	0.313	Poland	1996	0.065	0.288
Belgium	1999	0.054	0.213	Hungary	2001	0.086	0.315	Portugal	1996	0.005	0.213
Brazil	1996	0.062	0.344	India	1996	0.113	0.254	Singapore	1996	0.020	0.216
Canada	1996	0.053	0.222	Indonesia	1996	0.060	0.378	South Africa	2002	0.086	0.282
Chile	2002	0.044	0.217	Ireland	1996	0.063	0.240	South Korea	1996	0.067	0.340
China	1996	0.113	0.252	Italy	1999	0.023	0.235	Spain	1999	0.032	0.233
Colombia	2005	0.032	0.269	Japan	1999	0.039	0.193	Sweden	1996	0.098	0.251
Denmark	1996	0.117	0.195	Malaysia	1996	0.010	0.249	Switzerland	1996	0.073	0.177
Egypt	2000	0.019	0.236	Mexico	1996	0.092	0.268	Thailand	1996	0.006	0.279
Finland	1996	0.065	0.283	Netherlands	1996	0.060	0.225	Turkey	2006	0.019	0.363
France	1999	0.061	0.214	Norway	1999	0.079	0.256	U.K.	1996	0.036	0.190
				New Zealand	1996	0.050	0.190	U.S.	1996	0.112	0.174

Panel B. Average correlation of stock returns between two countries, by continent

	Africa	Asia	Australasia	Europe	N. America	S. America
Africa	0.179	0.345	0.404	0.379	0.389	0.386
Asia	0.345	0.396	0.406	0.385	0.374	0.390
Australasia	0.404	0.406	0.665	0.509	0.486	0.463
Europe	0.379	0.385	0.509	0.659	0.562	0.467
North America	0.389	0.374	0.486	0.562	0.628	0.526
South America	0.386	0.390	0.463	0.467	0.526	0.534

Panel C. Average competition between two countries, grouped by continent

	Africa	Asia	Australasia	Europe	N. America	S. America
Africa	0.105	0.130	0.130	0.146	0.161	0.125
Asia	0.084	0.238	0.126	0.161	0.222	0.093
Australasia	0.107	0.123	0.183	0.096	0.158	0.110
Europe	0.102	0.154	0.121	0.232	0.170	0.115
North America	0.093	0.146	0.106	0.134	0.168	0.093
South America	0.111	0.122	0.127	0.117	0.211	0.135

Table 2
Global Product Market Competition and Stock Market Comovement

This table summarizes the results of two-stage panel regressions, where the first stage is the yearly estimated regression of weekly returns:

$$R_{i,t} = \alpha_{i,j} + \beta_{i,j}R_{j,t} + \gamma_{i,j,D}R_{ij,D,t} + \gamma_{i,j,q}\Delta q_{i,j,t} + \epsilon_{i,j,t}.$$

Here, $R_{i,t}$ is the weekly stock returns of country i, $R_{j,t}$ is the returns of country j, $R_{ij,D,t}$ is the global stock return weighted by how countries i and j commonly rely on as a destination for their export market, and $\Delta q_{i,t}$ is the currency returns of country i relative to country j. Returns are expressed in local currency on the left side, whereas on the right side, returns are expressed in USD and $\beta_{i,j,q}$ is set to 0. The second-stage regression is a panel regression:

$$\hat{\beta}_{i,j,y} = \delta_1 Comp_{i,j,y-1} + \delta' Control_{i,j,y-1} + \text{FE}_{i,j,y} + e_{i,j,y},$$

where $\hat{\beta}_{i,j,y}$ is the beta estimated in the first-stage regression in year y, $Comp_{i,j,y-1}$ are lagged competition between countries i and j measure from country i's perspective. $CD_{i,j}$, $ExpShare_{i,j}$, $FracExp_i$, $ComSup_{i,j}$, and $ImpShare_{i,j}$ are trade measures used as control variables as defined in the main text. Driscoll and Kraay (1998) robust standard errors are summarized in parenthesis.

	Returns in local currency				Returns expressed in USD			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Comp_{i,j}$	−0.135**	−0.136**	−0.139**	−0.139**	−0.144**	−0.149**	−0.158**	−0.182***
	(0.067)	(0.067)	(0.068)	(0.069)	(0.067)	(0.067)	(0.068)	(0.069)
$CD_{i,j}$		0.034	0.026	0.026		0.113***	0.104**	0.073*
		(0.041)	(0.041)	(0.043)		(0.041)	(0.042)	(0.043)
$ExpShare_{i,j}$			0.008**	0.008**			0.010***	0.008**
			(0.004)	(0.004)			(0.004)	(0.004)
$FracExp_i$			−0.01	−0.01			−0.006	−0.007
			(0.009)	(0.009)			(0.009)	(0.009)
$ComSup_{i,j}$				−0.012				0.098**
				(0.040)				(0.040)
$ImpShare_{i,j}$				0.002				0.005
				(0.004)				(0.004)
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
County-pair FE	Y	Y	Y	Y	Y	Y	Y	Y
R-Sq	0.353	0.353	0.353	0.353	0.373	0.374	0.374	0.374
Adj R-Sq	0.321	0.321	0.321	0.321	0.343	0.343	0.343	0.343

Table 3
Industry Competition and Cross-country Industry Return Comovement

This table summarizes the results of the two-stage regression where the first stage is the regression of weekly industry stock returns:

$$\tilde{R}_{ind,i,t} = \alpha_{ind,i,j} + \beta_{ind,i,j}\tilde{R}_{ind,j,t} + \gamma_{ind,i,j,1}R_{ind,i,D,t} + \gamma_{ind,i,j,2}R_{ind,j,D,t} + \gamma_{ind,i,j,3}\Delta q_{i,t} + \gamma_{ind,i,j,4}\Delta q_{j,t} + \epsilon_{i,j,ind,t},$$

where $\tilde{R}_{ind,i,t}$ is the excess stock return of industry *ind* in country i and $R_{i,ind,d,t}$ is the downstream return of country i industry *ind*, the volume-weighted average industry returns determined from the OECD input-output table. $\Delta q_{i,j,t+1}$ is the currency return of country i relative to the currency of country j. In Panel A, returns are expressed in local returns. In Panel B, all stock returns are converted to USD and $\gamma_{i,j,q}$ is set to 0. The second stage is a panel regression

$$\hat{\beta}_{ind,i,j,y} = a + bIndComp_{ind,i,j,y-1} + e_{ind,i,j,y},$$

where $IndComp_{ind,i,j,y-1}$ is industry competition measure for industry *ind* computed between countries i and j in year $y-1$. Driscoll and Kraay (1998) robust standard errors are summarized in parenthesis.

Panel A. Returns in local currency

	Dependent variable: $\hat{\beta}_{ind,i,j}$			
	(1)	(2)	(3)	(4)
$IndComp_{ind,i,j}$	−0.590∗∗∗	−0.679∗∗∗	−1.164∗∗∗	−1.323∗∗∗
	(0.050)	(0.045)	(0.044)	(0.045)
Year FE	Y	Y	Y	Y
Country i FE	Y	N	Y	N
Country j FE	N	Y	Y	N
Country-pair FE	N	N	N	Y
Observations	198,242	198,242	198,242	198,242
R^2	0.059	0.242	0.304	0.313
Adjusted R^2	0.059	0.242	0.303	0.309

Panel B. Returns in USD

	Dependent variable: $\hat{\beta}_{ind,i,j}$			
	(1)	(2)	(3)	(4)
$IndComp_{ind,i,j}$	−0.640∗∗∗	−0.706∗∗∗	−1.209∗∗∗	−1.363∗∗∗
	(0.139)	(0.162)	(0.161)	(0.163)
Year FE	Y	Y	Y	Y
Country i FE	Y	N	Y	N
Country j FE	N	Y	Y	N
Country-pair FE	N	N	N	Y
Observations	198,243	198,243	198,243	198,243
R^2	0.067	0.238	0.306	0.316
Adjusted R^2	0.067	0.238	0.306	0.312

Table 4
Industry Competition and Upstream Returns

This table summarizes the results of the two-stage regression where the first-stage is the regression of weekly industry stock returns:

$$\tilde{R}_{ind,i,t} = \alpha_{ind,i,j} + \beta_{ind,i,j}\tilde{R}_{ind,j,U,t} + \gamma_{ind,i,j,0}\tilde{R}_{ind,i,U,t} + \gamma_{ind,i,j,1}R_{ind,i,D,t} + \gamma_{ind,i,j,2}R_{ind,j,D,t} + \gamma_{ind,i,j,3}\Delta q_{i,t} + \gamma_{ind,i,j,4}\Delta q_{j,t} + \epsilon_{i,j,ind,t},$$

where $\tilde{R}_{ind,i,t}$ is the excess stock return of industry *ind* in country i and $R_{i,ind,d,t}$ is country i's downstream return of industry *ind*, which is the volume-weighted average industry returns of downstream industries as reported in the OECD input-output table. $\Delta q_{i,j,t+1}$ is the currency return of country i relative to the currency of country j. In Panel A, returns are expressed in local returns. In Panel B, all stock returns are converted to USD and we set $\gamma_{ind,i,j,3} = \gamma_{ind,i,j,4} = 0$. The second stage is a panel regression

$$\hat{\beta}_{ind,i,j,y} = a + bIndComp_{ind,i,j,y-1} + e_{ind,i,j,y},$$

where $IndComp_{ind,i,j,y-1}$ is industry competition measure for industry *ind* computed between countries i and j in year $y-1$. Driscoll and Kraay (1998) robust standard errors are summarized in parenthesis.

Panel A. Returns in local currency

	Dependent variable: $\hat{\beta}_{ind,i,j,up}$			
	(1)	(2)	(3)	(4)
$IndComp_{ind,i,j}$	−1.523∗∗∗	−1.752∗∗∗	−1.769∗∗∗	−1.809∗∗∗
	(0.216)	(0.199)	(0.201)	(0.204)
Year FE	Y	Y	Y	Y
Country i FE	Y	N	Y	N
Country j FE	N	Y	Y	N
Country-pair FE	N	N	N	Y
Observations	197,758	197,758	197,758	197,758
R^2	0.029	0.027	0.045	0.052
Adjusted R^2	0.029	0.027	0.044	0.047

Panel B. Returns in USD

	Dependent variable: $\hat{\beta}_{ind,i,j,up}$			
	(1)	(2)	(3)	(4)
$IndComp_{ind,i,j}$	−1.550∗∗∗	−1.807∗∗∗	−1.795∗∗∗	−1.840∗∗∗
	(0.271)	(0.262)	(0.270)	(0.280)
Year FE	Y	Y	Y	Y
Country i FE	Y	N	Y	N
Country j FE	N	Y	Y	N
Country-pair FE	N	N	N	Y
Observations	197,758	197,758	197,758	197,758
R^2	0.028	0.024	0.043	0.051
Adjusted R^2	0.028	0.024	0.043	0.045

Table 5
Industry Competition and Downstream Returns

This table summarizes the results of the two-stage regression where the first-stage is the regression of weekly industry stock returns:

$$\tilde{R}_{ind,i,t} = \alpha_{ind,i,j} + \beta_{ind,i,j}\tilde{R}_{ind,j,t} + \gamma_{ind,i,j,2}R_{ind,j,D,t} + \gamma_{ind,i,j,3}\Delta q_{i,t} + \gamma_{ind,i,j,4}\Delta q_{j,t} + \epsilon_{i,j,ind,t},$$

where $\tilde{R}_{ind,i,t}$ is the excess stock return of industry *ind* in country i and $R_{j,ind,d,t}$ is the downstream return of country j industry *ind*, the volume-weighted average industry returns determined from the OECD input-output table. $\Delta q_{i,j,t+1}$ is the currency return of country i relative to the currency of country j. In Panel A, returns are expressed in local returns. In Panel B, all stock returns are converted to USD and we set $\gamma_{ind,i,j,3} = \gamma_{ind,i,j,4} = 0$. The second stage is a panel regression

$$\hat{\gamma}_{ind,i,j,d,y} = a + bIndComp_{ind,i,j,y-1} + e_{ind,i,j,y},$$

where $IndComp_{ind,i,j,y-1}$ is industry competition measure for industry *ind* computed between countries i and j in year $y-1$. Driscoll and Kraay (1998) robust standard errors are summarized in parenthesis.

Panel A. Returns in local currency

	Dependent variable: $\hat{\gamma}_{ind,i,j,d}$			
	(1)	(2)	(3)	(4)
$IndComp_{ind,i,j}$	0.555**	0.953***	0.543*	0.238
	(0.276)	(0.215)	(0.278)	(0.275)
Year FE	Y	Y	Y	Y
Country i FE	Y	N	Y	N
Country j FE	N	Y	Y	N
Country-pair FE	N	N	N	Y
Observations	198,604	198,604	198,604	198,604
R^2	0.049	0.032	0.062	0.074
Adjusted R^2	0.049	0.032	0.061	0.069

Panel B. Returns in USD

	Dependent variable: $\hat{\gamma}_{ind,i,j,d,y}$			
	(1)	(2)	(3)	(4)
$IndComp_{ind,i,j}$	0.803**	1.225***	0.831**	0.538*
	(0.319)	(0.232)	(0.326)	(0.325)
Year FE	Y	Y	Y	Y
Country i FE	Y	N	Y	N
Country j FE	N	Y	Y	N
Country-pair FE	N	N	N	Y
Observations	198,604	198,604	198,604	198,604
R^2	0.057	0.038	0.07	0.084
Adjusted R^2	0.057	0.037	0.07	0.079

Table 6
Trade Competition and Stock Market Correlations from US perspective

This table summarizes the results of the two-stage panel regression model, where the first stage is the time-series regression estimated year-by-year:

$$R_{i,t} = \alpha_i + \beta_{i,US} R_{US,t} + \epsilon_{i,t},$$

where $R_{i,t}$ is the stock returns of country i and $R_{US,t}$ is the US stock returns, of which both are denominated in USD. The first-stage regression estimates are included in the second-stage panel regression with the following specification:

$$\hat{\beta}_{i,US,y} = \delta_1 Comp_{i,US,y-1} + \delta' Control_{i,US,y-1} + \text{Year FE}_y + e_{i,y},$$

where $\hat{\beta}_{i,US,y}$ is the estimate from each first-stage regression, $CD_{i,US,y-1}$ and $Comp_{i,US,y-1}$ are common demand share and competition measures of year $y-1$ as defined in the main text. Control includes the common demand share between countries i and j (CD), country i's fraction of export to the US ($ExpShare$), the fraction of export to the total GDP of country i ($FracExp_i$), common supply share (CS), and country i's import to the US ($ImpShare$) as a fraction of total import of country i, as defined in the main text. The left three columns summarize the result where weekly stock returns are used, and the right three columns show those using monthly stock returns. Driscoll and Kraay (1998) robust standard errors are summarized in parenthesis.

	Dependent variable: $\hat{\beta}_{i,US}$					
	Weekly regression			Monthly regression		
	(1)	(2)	(3)	(4)	(5)	(6)
$Comp_{i,US}$	−2.495***	−1.905***	−2.199***	−2.030***	−2.134***	−2.321***
	(0.498)	(0.485)	(0.555)	(0.435)	(0.441)	(0.504)
$CD_{i,US}$	−0.192	−0.857***	−1.070***	0.086	0.199	0.007
	(0.253)	(0.257)	(0.288)	(0.221)	(0.234)	(0.261)
$ExpShare_{i,US}$		0.234***	0.291***		−0.032	0.035
		(0.028)	(0.053)		(0.025)	(0.048)
$FracExp_i$			0.025			0.033
			(0.044)			(0.040)
$ComSup_{i,US}$			0.613			0.496
			(0.410)			(0.373)
$ImpShare_{i,US}$			−0.074			−0.082*
			(0.053)			(0.048)
Year FE	Y	Y	Y	Y	Y	Y
Observations	888	888	888	888	888	888
R^2	0.564	0.598	0.599	0.409	0.411	0.413
Adjusted R^2	0.550	0.584	0.584	0.391	0.391	0.392

Table 7
Cross-country correlation between discount rate shocks and trade competition

This table summarizes the result of the two-stage panel regression where the first stage is the yearly estimated time-series regression using monthly returns:

$$R_{i,t} = \alpha_i + \beta_{i,m} R_{US,t} + \gamma_{i,pred} \Delta Pred_t + \epsilon_{i,t},$$

where $R_{i,t}$ is the stock returns of country i, $R_{US,t}$ is the US stock returns, of which both are denominated in USD, and $\Delta Pred_t$ is the first-order difference in the return predictor of stock market returns. Predictors used are the price-to-divided ratio, the variance risk premium (VRP), and the term spread. The second stage is a panel regression of

$$Slope_{i,y} = \delta_1 Comp_{i,US,y-1} + \delta' Control_{i,US,y-1} + \text{Year FE}_y + e_{i,y},$$

where $Slope_{i,y}$ is either the estimated β or γ coefficients of the first stage regression estimated for year y, Independent variables as defined in the previous tables. Driscoll and Kraay (1998) robust standard errors are summarized in parenthesis.

Panel A. Slope on US returns

	Price-to-dividends		VRP		Term Spread	
	(1)	(2)	(3)	(4)	(5)	(6)
$Comp_{i,US}$	−2.249***	−1.927**	−1.851***	−2.054**	−1.897***	−2.312***
	(0.847)	(1.112)	(0.718)	(1.031)	(0.749)	(1.044)
$CD_{i,US}$	−0.082	0.362	−0.141	0.143	0.114	0.431
	(0.425)	(0.439)	(0.401)	(0.373)	(0.335)	(0.305)
$ExpShare_{i,US}$		−0.026		0.000		0.000
		(0.062)		(0.053)		(0.045)
$FracExp_i$		0.017		0.001		0.001
		(0.081)		(0.091)		(0.072)
$ComSup_{i,US}$		−0.307		0.018*		0.018*
		(0.472)		(0.438)		(0.390)
$ImpShare_{i,US}$		−0.043		0.000		0.000
		(0.076)		(0.060)		(0.049)
Year FE	Y	Y	Y	Y	Y	Y
Observations	888	888	888	888	888	888
R^2	0.377	0.382	0.388	0.393	0.401	0.405
Adjusted R^2	0.358	0.359	0.369	0.371	0.382	0.384

Panel B. Slope on discount rate shocks

	Price-to-dividends		VRP		Term Spread	
	(1)	(2)	(3)	(4)	(5)	(6)
$Comp_{i,US}$	0.014	−0.003	0.001	−0.002	−4.858	1.825
	(0.011)	(0.009)	(0.001)	(0.002)	(8.389)	(11.705)
$CD_{i,US}$	−0.001	−0.002	−0.001	−0.002	−8.404***	−9.039*
	(0.007)	(0.008)	(0.002)	(0.003)	(4.695)	(4.072)
$ExpShare_{i,US}$		0.000		0.000		0.000
		(0.001)		(0.000)		(0.647)
$FracExp_i$		0.001		0.001		0.001
		(0.001)		(0.000)		(0.558)
$ComSup_{i,US}$		0.018*		0.018*		0.018*
		(0.008)		(0.003)		(5.581)
$ImpShare_{i,US}$		0.000		0.000		0.000
		(0.001)		(0.000)		(0.552)
Year FE	Y	Y	Y	Y	Y	Y
Observations	888	888	888	888	888	888
R^2	0.289	0.292	0.284	0.286	0.220	0.226
Adjusted R^2	0.267	0.266	0.262	0.260	0.195	0.198

Apppendix A. Model Derivation

With the given utility function, the demand function for product k_0 in country i is

$$X_{i,k_0} = \frac{\alpha_{k_0} Y_i}{P_{k_0}},$$

where P_{k_0} is the price of product k_0 and Y_i is the total wealth of country i.

The optimal export of country j_0 producing k_0, when $\Omega_{i,k_0} = \{j_0, j_1\}$ and $\{j_0, j_1\} \not\subset \Omega_{i,k}, k \neq k_0$, can be solved via the maximization problem of the profit function:

$$\alpha_{k_0} Y_i (x_{j_0,i,k_0} + x_{j_1,i,k_0})^{-1} x_{j_0,i,k_0} - \frac{w_j \tau_{i,j}}{\phi_j} x_{j_0,i,k_0}.$$

The first-order condition is:

$$x_{j_1,i,k_0} \times \alpha_{k_0} Y_i = \frac{w_{j_0} \tau_{i,j_0}}{\phi_{j_0}} (x_{j_0,i,k_0} + x_{j_1,i,k_0})^2. \tag{1}$$

With a competing firm producing product k_0 in country j_1 solving a symmetric problem, one can verify that the following should hold:

$$x_{j_1,i,k_0} = \frac{\phi_{j_1} w_{j_0} \tau_{i,j_0}}{\phi_{j_0} w_{j_1} \tau_{i,j_1}} x_{j_0,i,k_0}. \tag{2}$$

Plugging in Equation (2) into (1), one can verify that Equation (2) in the main text should hold. The optimal demand for country i is

$$\begin{aligned} X^*_{i,k_0} &= \left[\frac{\phi_{j_1}}{w_{j_1} \tau_{i,j_1}} \left(1 + \frac{\phi_{j_1} w_{j_0} \tau_{i,j_0}}{\phi_{j_0} w_{j_1} \tau_{i,j_1}} \right)^{-2} + \frac{\phi_{j_0}}{w_{j_0} \tau_{i,j_0}} \left(1 + \frac{\phi_{j_0} w_{j_1} \tau_{i,j_1}}{\phi_{j_1} w_{j_0} \tau_{i,j_0}} \right)^{-2} \right] \alpha_{k_0} Y_i \\ &= \frac{\phi_{j_0} \phi_{j_1}}{\phi_{j_1} w_{j_0} \tau_{i,j_0} + \phi_{j_0} w_{j_1} \tau_{i,j_1}} \alpha_{k_0} Y_i. \end{aligned}$$

Therefore, the price for product X_{k_0} is given by

$$P_{i,k_0} = \frac{w_{j_1}\tau_{j_1,i}}{\phi_{j_1}} + \frac{w_{j_0}\tau_{j_0,i}}{\phi_{j_0}}, \tag{3}$$

The profit for country j_0 at optimum is

$$(P_{k_0} - \frac{w_{j_0}\tau_{i,j_0}}{\phi_{j_0}})x_{j_0,i,k_0} = \left(1 + \frac{\phi_{j_1}w_{j_0}\tau_{i,j_0}}{\phi_{j_0}w_{j_1}\tau_{i,j_1}}\right)^{-2}\alpha_{k_0}Y_i. \tag{4}$$

Apppendix B. Additional Empirical Analysis

1. Upstream vs. downstream returns

The main analysis shows that supply-driven shocks are the source of the lower comovement between the same industry stock returns in two different countries. In this Appendix, we use the US as the focal country and test whether the lower comovement of country stock returns between two competing countries can be attributed to supply-driven shocks

To facilitate this analysis, we proxy demand and supply shocks using stock returns of firms based on their distance to the consumers (See, for example, Gofman, Segal, and Wu (2020), among others.) Downstream firms are located lower in the supply chain and produce goods directly consumed by end customers, whereas upstream firms are located higher in the supply chain. They process raw materials and supply parts and materials used for further processing by downstream firms in the supply chain. Hence, a positive shock to upstream firms would benefit firms within the same supply chain and hurt firms operating in other supply chains. As a result, countries that compete with the US should move less with the stock prices of US upstream firms.

We use the Input-Output table of the Bureau of Economic Analysis (BEA) to quantify the vertical position of industries. The BEA produces supply and use tables separately. Supply tables show the goods and services produced by each industry, while use tables show who uses these goods and services. The supply and use tables can be combined to produce a matrix of the flows of commodities to the final customer. We follow Antràs, Chor, Fally, and Hillberry (2012) to construct a measure of vertical position for each industry. The supply table ($M \times N$ matrix) shows how N different goods and services are produced in each of the M industries. The use table ($N \times M+1$ matrix) contains how these M industries, in addition to the end customer, use the N different produced products. To calculate the proportion of products produced in one industry that flows into another, we can combine the supply and use tables. The steps are detailed, e.g., in Ahern and Harford (2014).

The first step is to normalize these two matrices by dividing each element by its row mean such that each row has a sum of one. The next step is to multiply the normalized supply table (S) by the use table (U) to generate a M by $M+1$ matrix. The last column of this matrix contains information about the proportion of industry output that is consumed by the end customer. If this proportion is high, the industry is more likely to be a downstream industry. If this is low, the industry is more likely to be an upstream industry.

The vertical position (VP) is defined as in Antràs, Chor, Fally, and Hillberry (2012). That is,

$$VP_{M\times 1} = (I_{M\times M} - S_{M\times N} \times U_{N\times M})^{-1} 1_{M\times 1}, \tag{5}$$

where $I_{M\times M}$ is a M-dimensional identity matrix and $1_{M\times 1}$ is a vector of ones. Note that the last column of the user matrix is removed from the computation but is redundant after the normalization. The M-vector VP is the vertical position of each industry. If this is high the industry is more likely to be downstream and vice versa.

We first sort industries by their vertical position in the supply chain and assign firms based on the industries they operate into three groups: upstream, midstream, and downstream firms. We then repeat the previous analysis after replacing the US returns with the respective returns of upstream and downstream industry portfolios in the first-stage regression. Table Apppendix B.1 summarizes the results of the second-stage regression, with each column corresponding to betas estimated using either upstream or downstream US industry returns regressed on the trade measures. In columns denoted by Models 1–3, the betas are from first-stage regressions estimated using upstream industry returns. In the remaining columns (Models 4–6), the betas are estimated using downstream industry returns.

The patterns obtained using upstream US returns in Models 1-3 are consistent with our baseline weekly results in Table 6 and particularly the negative coefficients for the competition measure. In contrast, we do not observe a similar pattern using downstream US returns in Models 4-6. The contrasting patterns are consistent with the hypothesis that countries that compete with the US have lower returns upon a positive supply shock in the US (as reflected in upstream US returns), but the effect is muted for a positive demand shock in the US (as reflected in downstream US returns). The general intuition from these results is that US supply shocks are propagated through the competition channel.[5]

2. Exploring the terms-of-trade channel

The fluctuation of the foreign exchange rate is an important consideration in any analysis of cross-country stock correlations. In the current context, the patterns that we document regarding the effects of the two trade channels on cross-country comovement of stock returns could be driven by changes in the relative value of currencies rather than the value of equities. This alternative channel is potentially relevant in this context because all stock returns in the main analysis are translated to a common currency. In this section, we continue to use the US as a focal country because it is simpler to focus on a single country and the currency value variation with respect to a focal currency.

We first elucidate how changes in the terms of trade could drive the relationship between cross-country comovement and product market competition under two distinct scenarios. The first scenario is that a positive productivity shock in the US leads to currency *depreciations* of countries competing with the US, relative to USD. As export prices relatively increase, equity value would increase (and not decrease) in those countries, at least in domestic terms, as predicted by Pavlova and Rigobon (2007). Reconciling this effect with the

[5] We do not observe any significant difference in currency returns between the two groups of regressions.

empirical findings we document in the previous section would require the "currency translation" effect (i.e., competing countries' USD-denominated returns mainly driven by changes in currency valuation) to be the primary driver of the observed patterns between product market competition and stock market comovement. Empirically, this means that we should be able to observe the terms-of-trade effect once we control for the translation effect.

The second scenario is that a positive US productivity shock leads to a currency *appreciation* of competing countries. The "terms-of-trade" effect in this scenario would predict lower stock returns, in domestic currency terms, for competing countries as their terms-of-trade worsen. If this is indeed the key mechanism driving the competition effect, the empirical results would be driven by the domestic currency denominated stock returns, with the currency translation component working in the opposite direction to partially offset the lower comovement. In other words, we should observe that currency values relative to USD of competing countries have a higher comovement with US stock prices.

To investigate these potential terms-of-trade-driven scenarios, we perform two related analyses. First, we attempt to remove the effect of currency translations of the USD-denominated stock returns of each country. This allows us to examine whether the first scenario (i.e., depreciation) is plausible. Second, we directly examine the link between currency returns (relative to USD) and the US stock market. In this analysis, we assign the currency returns as the dependent variable in the first-stage regression. This allows us to examine whether the second scenario (i.e., appreciation) is plausible. The results of both analyses are reported in Table Apppendix B.2.

The left three columns present the estimates from the second-stage regressions when local currency returns are used as the dependent variable in the first-stage regression. We find that the sensitivity of a country's stock returns to US stock returns positively correlates with product market competition when expressing returns in local currency. In other words, positive US stock returns tend to be followed by a relative decrease, not an increase as implied by the terms-of-trade mechanism, in stock prices in countries that compete more intensely with the US in the product markets, even after controlling for the currency translation effect. Hence, we can conclude that the first scenario through which the terms-of-trade channel may be relevant does not seem plausible.

The right three columns present the estimates from the second-stage regressions when currency returns are used as the dependent variable in the first-stage regression. The results indicate that the product market competition measure has a negative correlation with the sensitivity of non-US currency returns to US stock returns. This implies a relative currency depreciation for countries that compete more intensely with the US following positive US stock returns, inconsistent with the second scenario in which the terms-of-trade mechanism is relevant.

In aggregate, the patterns we observe using this return decomposition are not fully consistent with the standard terms-of-trade mechanism. We, therefore, conclude that the negative effect of product market competition on international stock return correlations does not operate through this currency-driven mechanism.

Table Apppendix B.1
Supply vs Demand Shock

This table summarizes the results of the two-stage panel regression model, where the first stage is the time-series regression estimated using weekly returns year-by-year:

$$R_{i,t} = \alpha_i + \beta_{i,u} R^u_{US,t} + \beta_{i,d} R^d_{US,t} + \epsilon_{i,t},$$

where $R_{i,t}$ is the stock returns of country i and $R_{US,t}$ is the US stock returns, and $R^u_{US,t}$ and $R^d_{US,t}$ are the US upstream and downstream industry returns, of which all are denominated in USD. Upstream industries are US industries classified as suppliers in the supply chain, whereas downstream industries are classified as close to the end users of the product in the supply chain. The second-stage regression is identical to Table 6, but the dependent variable is $\hat{\beta}_{i,u}$ for the left three columns, and $\hat{\beta}_{i,d}$ is for the right three columns of the table. Driscoll and Kraay (1998) robust standard errors are summarized in parenthesis.

	Using upstream returns			Using downstream returns		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.093	0.216∗∗∗	0.128	−0.446∗∗∗	−0.086	−0.089
	(0.072)	(0.078)	(0.113)	(0.080)	(0.191)	(0.194)
$Comp_{i,US}$	−1.370∗∗∗	−1.361∗∗∗	−1.826∗∗∗	0.002	0.007	0.019
	(0.237)	(0.234)	(0.336)	(0.242)	(0.211)	(0.288)
$CD_{i,US}$	0.556∗∗∗	0.412∗∗∗	0.313∗∗∗	0.307∗∗∗	−0.007	−0.005
	(0.091)	(0.087)	(0.083)	(0.104)	(0.226)	(0.222)
$ExpShare_{i,US}$		0.027	−0.0001		0.065∗∗	0.069
		(0.017)	(0.022)		(0.032)	(0.046)
$FracExp_i$		−0.005	0.023		0.039∗∗	0.038∗
		(0.026)	(0.024)		(0.020)	(0.023)
$ComSup_{i,US}$			0.447∗∗			−0.005
			(0.218)			(0.224)
$ImpShare_{i,US}$			0.03			−0.004
			(0.021)			(0.026)
Observations	888	888	888	888	888	888
R^2	0.220	0.222	0.233	0.129	0.143	0.143
Adjusted R^2	0.195	0.195	0.205	0.102	0.114	0.112

Table Apppendix B.2
Currency Returns vs Local Currency Denominated Stock Returns

This table summarizes the results of the two-stage panel regression model, where the first stage are the time-series regressions estimated using weekly returns year-by-year:

$$Dep_{i,t} = \alpha_i + \beta_{i,m} R_{US,t} + \epsilon_{i,t},$$

where $Dep_{i,t}$ is either the stock returns of country i deonominated in local currency or the currency return of country i relative to USD. The second-stage regression is identical to Table 6. For the left three columns, the first-stage dependent variable is the stock returns of country i in local currency. For the right three columns the dependent variable in the first-stage regression is the currency return of country i relative to USD. Driscoll and Kraay (1998) robust standard errors are summarized in parenthesis.

	Local currency stock returns			Currency returns		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.129	0.573∗∗∗	0.414∗∗	−0.343∗∗∗	−0.004	−0.170∗∗
	(0.124)	(0.111)	(0.169)	(0.111)	(0.051)	(0.073)
$Comp_{i,US}$	−2.293∗∗∗	−1.951∗∗∗	−2.018∗∗∗	−1.220∗∗∗	−0.904∗∗∗	−1.636∗∗∗
	(0.372)	(0.405)	(0.398)	(0.300)	(0.285)	(0.313)
$CD_{i,US}$	−0.388	−0.780∗∗∗	−0.939∗∗∗	1.019∗∗∗	0.663∗∗∗	0.618∗∗∗
	(0.297)	(0.227)	(0.281)	(0.254)	(0.164)	(0.185)
$ExpShare_{i,US}$		0.147∗∗∗	0.218∗∗∗		0.124∗∗∗	0.015
		(0.028)	(0.047)		(0.029)	(0.025)
$FracExp_i$		0.032	0.035		0.0003	0.049∗∗∗
		(0.029)	(0.039)		(0.010)	(0.017)
$ComSup_{i,US}$			0.344			0.628∗∗∗
			(0.390)			(0.201)
$ImpShare_{i,US}$			−0.083∗∗			0.105∗∗∗
			(0.036)			(0.035)
Observations	888	888	888	888	888	888
R^2	0.445	0.466	0.468	0.530	0.572	0.599
Adjusted R^2	0.427	0.448	0.449	0.515	0.558	0.585