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Competing Gains From Trade[*]

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Abstract

Differences in growth rates across countries imply a strong relation between factor proportions based trade and key aggregate economic outcomes. We construct two macro-trade datasets and illustrate that this relation is rather weak in the data. We propose a simple explanation: in the presence of intra-industry trade, pronounced trade specialization patterns culminate in a loss of varieties. In a dynamic two-country model, we illustrate that the introduction of intra-industry trade overwhelmingly subdues the inter-industry trade dynamics and realigns the behavior of standard models with the empirical evidence along various dimensions. We also provide empirical support for our mechanism: labor and capital intensive goods are traded between developed and developing countries in both directions and in similar proportions in overall trade.

JEL: F11, F12, F32, F41, F43
Keywords: Heckscher Ohlin, Armington trade, factor proportion based trade, comparative advantage, dynamic two-country general equilibrium models, Feldstein-Horioka

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1 Introduction

The substantial increase in cross border flows of goods and services over the last 60 years has heightened the importance of trade dynamics for aggregate economic outcomes. Nevertheless, few studies have explored this interaction. To a great extent, this scarcity can be attributed to the severe difficulty of integrating industry heterogeneity in production technologies, the key feature of many trade models, into macroeconomic frameworks. Macroeconomic frameworks with industry heterogeneity typically imply pronounced trade specialization patterns and substantial output composition shifts that strongly correlate with key aggregate economic outcomes, see e.g. Antràs and Caballero (2009), Jin (2012), Ju et al. (2014), Zymek (2015), and Jin and Li (2018).[1] Crucially, our paper demonstrates that it is difficult to reconcile these theoretical implications with the empirical evidence, and subsequently offers a resolution to this inconsistency.

We commence our analysis by constructing two macro-trade datasets, one based on U.S. trade data and the other on world trade data, to investigate the relation between factor-proportions based trade and aggregate economic outcomes such as saving and investment rates.[2] To gauge trade specialization patterns across capital- and labor-intensive industries, we employ non-parametric measures of revealed comparative advantage (RCA). Conducting cross-sectional and panel assessments, we find that the relation between RCA and key macroeconomic outcomes is fairly weak. Following on from this result, we then show that introducing cross-country intra-industry trade linkages into dynamic two-country models of industry heterogeneity can realign the predictions of standard theories with the empirical evidence along several dimensions.

The theoretical section of our paper presents a dynamic two-country general equilibrium model of industry heterogeneity in capital intensity and productivity. Using this framework, we first demonstrate that, without intra-industry trade, persistent productivity growth differentials across countries induce significant changes in both trade specialization patterns and aggregate economic outcomes. In turn, these shifts imply that measures of comparative advantage are highly correlated with cross-country discrepancies in saving, investment, external balances and GDP growth. As we show, such correlations are largely unobserved in the data because trade specialization patterns are not very pronounced. We then augment the model with intra-industry trade and examine the dynamics under the same growth differentials. When there are gains from both inter- and intra-industry trade, trade specialization is overwhelmingly subdued.

[1] In the class of standard dynamic two-country general equilibrium models that we study, factor proportions based trade dynamics are triggered by relative labor productivity growth between countries. In standard two-country models of trade, the increase in relative labor productivity causes the faster-growing country to specialize in the production of labor-intensive goods and the slower-growing country to specialize in the production of capital-intensive goods. In standard macroeconomic models, this increase results in relatively high investment and relatively low saving in the faster-growing country. In a combined macro-trade model, we thus see a relation between trade patterns and aggregate economic outcomes.

[2] In our paper, the term "factor proportions based trade" is used synonymously with "inter-industry trade" and refers to the trade theory patterns of Heckscher (1919), and Ohlin (1933). Meanwhile, the term "intra-industry trade" refers to the trade theory patterns of Armington (1969).

As a result, measures of comparative advantage are uncorrelated with key macroeconomic outcomes as found in the data.

The mechanism that underlies the flat RCA response in the intra-industry trade model has its roots in the degree of substitution between domestic and foreign varieties of tradable goods. Specifically, the benchmark model first examined implicitly assumes that goods across countries within a particular tradable industry are perfect substitutes. The high substitutability of home for foreign varieties within tradable industries means that there are large gains from trade specialization. As a result, an optimal global allocation in the standard model is synonymous with each country specializing in a particular industry. Conversely, once intra-industry trade features in the framework, the implied substitutability between home and foreign varieties of the same good is relatively low. The implication of the imperfect substitutability is that pronounced trade specialization under growth differentials result in a loss of varieties. Therefore, the strong inter-industry trade dynamics predicted under growth differentials do not materialize in the presence of intra-industry trade. Put differently, the gains from intra–industry trade theory subdue the gains the from factor-proportions trade theory.

Is there intra-industry trade between developed and developing countries? We find that both developed and developing countries import and export both capital and labor intensive goods from/to each other. Importantly, the shares of these goods in total developed-developing trade are very similar across these two country groups. Moreover, they are stable across time. For instance, while 24% of developing countries imports from developed countries are capital intensive in 1995, 21% of developed countries imports from developing countries are capital intensive. In turn, 76% of developing countries imports from developed countries are labor intensive, 79% of developed countries imports from developing countries are labor intensive.

An important by-product of our theoretical analysis is that we are able to match the positive correlation between saving and investment rates observed in the cross-country data, as first documented by Feldstein and Horioka (1980).[3] The field offers two primary explanations for the positive comovement, namely frictions in goods and frictions in financial markets. Caballero et al. (2008), Bai and Zhang (2010), Mendoza et al. (2007), Antràs and Caballero (2009), Angeletos and Panousi (2011), and Coeurdacier et al. (2015) have recently highlighted the latter explanation. Our paper is more closely related to the former explanation which has been emphasized by Obstfeld and Rogoff (2000) and Eaton et al. (2015), among others. However, we deviate from this literature by underlining that an empirically motivated industry structure can engender the positive correlation identified between saving and investment across countries.

[3] Their finding of a large and significant correlation has been replicated many times with post-World War II and historical data using both cross-section and time-series analyses, so much so that the result carries the status of "stylized fact" (see e.g. Baxter and Crucini (1993), Obstfeld and Rogoff (2000), and Eaton et al. (2015)). This literature is directly linked to studies on the direction of international capital flows (see Lucas (1990) and Gourinchas and Jeanne (2013) for example).

The paper primarily contributes to the body of work that seeks to integrate trade dynamics into open economy macro models, including Findlay (1970), Mussa (1978), Ventura (1997), Cunat and Maffezzoli (2004), Ghironi and Melitz (2005), Antràs and Caballero (2009), Bajona and Kehoe (2010), Jin (2012), Ju et al. (2014), Zymek (2015), and Jin and Li (2018) among others. Notably, we depart from this literature by focusing on a general problem. The basic difficulty, as we show, is to integrate industry heterogeneity in production technologies into dynamic two-country macroeconomic frameworks. We illustrate that in standard two-country models of industry heterogeneity, growth differentials between countries create wild output composition shifts that are difficult to reconcile with the empirical evidence. While labor-augmenting technical change helps to shut down non-balanced growth in closed economy models, it does not suffice in dynamic two-country models with unexpected growth differentials.[4] In this latter class of models, substantial output composition shifts arise due to gains from factor proportions based trade and, thereby, lead to a misalignment between the model behavior and the empirical evidence. Adding intra-industry trade to an otherwise standard open economy model of industry heterogeneity realigns the predictions of standard models with the empirical evidence by suppressing factor proportions based trade.

The study further relates to a literature in international trade and international macroeconomics dealing with the old but important question in the field: are trade and factor mobility complements or substitutes? Antràs and Caballero (2009) contend that trade and capital flows can complement one another in a world of heterogeneous financial development, while Jin (2012) shows that trade specialization can be a substitute for capital flows under somewhat extreme parameter assumptions. Ju et al. (2014) examine the interaction between trade specialization and capital flows under trade-, labor-, and capital-market frictions. Mundell (1957) is the first to focus on the interaction among trade specialization and factor mobility. Other contributors to this particular field include Samuelson (1971), Markusen (1983), Jones (1967, 1989), Neary (1995), and Rauch (1991). We re-examine the substitutability in a modern dynamic stochastic two-country macroeconomic framework. We illustrate both theoretically and empirically that the interaction between standard inter-industry trade dynamics and key aggregate economic outcomes is fairly weak, and thus that inter-industry trade and capital mobility is rather orthogonal. Our empirical findings are consistent with Bowen et al. (1987), Courant and Deardorff (1992), Trefler (1995), Davis and Weinstein (2001), Schott (2004), Trefler and Zhu (2010), and Morrow and Trefler (2017) to mention but a few, who underline that the evidence in favor of the endowments-driven trade theory in its basic form is rather scarce.[5]

[4]In analyzing closed economy models of industry heterogeneity in labor intensity and productivity, Uzawa (1961) and Acemoglu (2002), among others, show that labor-augmenting technical progress is theoretically necessary for keeping the economy on the balanced growth path. In Sorg-Langhans et al. (2018) we use labor-augmenting technical change in a dynamic two-country model to show that it eradicates the gains from factor-proportions trade in the absence of unexpected growth differentials between countries. We note that the bias in technical change, whether it be capital augmenting, labor augmenting, or neutral, does not influence our central result, namely that intra-industry trade suppresses inter-industry trade dynamics.

[5]Studies in this literature often focus on the Heckscher-Ohlin-Vanek theorem, a generalization of the Heckscher-Ohlin theorem, which states that a capital-abundant country exports capital intensive goods and services.

The remainder of the paper is organized as follows. Section 2 provides the empirical motivation for our theoretical analysis. Section 3 lays out the model, while section 4 numerically simulates the model under persistent growth differentials in the cases of i) inter-industry trade and ii) inter- and intra-industry trade. Lastly, section 5 concludes.

2 Empirical Motivation

Standard two-country models of industry heterogeneity predict a strong link between inter-industry trade dynamics and key aggregate economic indicators, such as saving and investment rates. Accordingly, across a diverse panel of 76 countries and over periods of up to 20 years, we empirically analyze the extent to which such predictions materialize in the data. In the first two subsections that follow, we provide detailed information on the constructed datasets and empirical methodology employed. The final subsection discusses the findings.

2.1 Data

To obtain measures of inter-industry trade, we construct two disaggregated international trade datasets - one based on U.S. trade data and the other based on World trade data. In particular, the first set combines the U.S. 6-digit North American Industry Classification System (NAICS) trade data of Schott (2008) with Census trade data in order to yield the extended sample period 1989-2008. Meanwhile, the second set uses the product-level BACI World trade data of the CEPII over the period 1995-2006.[6] We rectangularize the raw datasets by treating any missing values as zero import or export flows. For the latter dataset, we transform the 6-digit HS-1992 data into 4-digit Standard Industrial Classification (SIC) categories using a concordance from the World Bank. Subsequently, we are able to link both datasets to the NBER-CES Manufacturing Industry database (Becker et al. (2009)) which includes subsectoral information on variables such as employment, payroll, investment, capital stock, and value added.[7] This completes the datasets for the purposes of calculating different indices of inter-industry trade dynamics.

We capture such trade specialization in capital and labor-intensive manufacturing industries across countries by computing trade-weighted measures of revealed comparative advantage. More precisely, for country i at time t, we define revealed comparative advantage (RCA) in capital-intensive goods as the trade-weighted capital intensity of exports

$$RCA_{i,t} = \sum_{z \in Z} \frac{x_{i,z,t}}{X_{i,t}} k_{z,t} \tag{1}$$

[6] At the industry/product-level, NAICS data gauge exports by countries to the U.S., while BACI data which are drawn on UN COMTRADE data reflect exports of countries to the rest of the world.

[7] Note that the NBER-CES Manufacturing data are available at the 6-digit NAICS level consisting of 473 industries and the 4-digit SIC level consisting of 459 industries. After these data are paired with the corresponding trade data, we are left with 389 NAICS and 386 SIC common manufacturing industries.

where $x_{i,z,t}$ denotes the exports of country i in industry $z \in Z$ to the U.S./World in period t, $X_{i,t}$ represents the total exports of country i to the U.S./World in period t, and $k_{z,t}$ is the capital intensity of industry z in period t. Given the trade-weighted nature of the measure, we note that the index is insensitive to the digit level of the trade data. Furthermore, we point out that this measure of trade specialization derives directly from the theory, which we outline in section 3.[8] As evident from equation (1), we make the standard assumption that industry factor intensities are the same across countries, thus allowing factor intensity to be consistently ranked using factor share data for just one country, namely the U.S..[9] We use U.S. capital intensity data both for reasons of availability and attractiveness given the size and diversity of the country's industrial economy. Following the literature, we employ three different measures of capital intensity

$$k^1_{z,t} = \ln\left(\frac{\text{cap}}{\text{emp}}\right)_{z,t} \tag{2a}$$

$$k^2_{z,t} = 1 - \left(\frac{\text{pay}}{\text{vadd}}\right)_{z,t} \tag{2b}$$

$$k^3_{z,t} = \left(\frac{\text{invest}}{\text{pay}}\right)_{z,t} \tag{2c}$$

where "cap" is the total real capital stock, "emp" is total employment, "pay" is total payroll, "vadd" is total value added, and "invest" is total capital expenditure. Physical capital intensity as measured by the logarithm of the real capital stock per worker (k^1) is adopted from Antràs (2015), while capital intensity defined as 1 minus the share of total labor compensation in value added (k^2) is taken from Romalis (2004) and Jin (2012). The third measure (k^3) given as the capital to labor expenditure ratio provides an additional robustness check by using the corresponding spending flows version of equation (2a). Table 1 displays the correlation matrix for the three capital intensity measures. While the results indicate a relatively strong positive comovement amongst the three variants, the correlations are still sufficiently imperfect for a consideration of all three to be warranted. Turning to Table 2, we also observe that the resulting revealed comparative advantage indices positively covary across NAICS and BACI trade data samples, with correlation coefficients of moderate magnitudes.

We next augment the panel RCA measures across both trade datasets with standard macroeconomic variables to form the final macro-trade repositories required for the empirical assessment. We acquire information on saving, investment, current account balances, real GDP per capita growth rates, demographics consisting of youth-old age dependency ratios, and trade openness from the World Bank's World

[8] We also examined alternative measures of RCA for the purposes of gauging inter-industry trade dynamics. For example, we constructed RCA indices that follow the approach of Romalis (2004), which is closely related to that of Balassa (1963). This methodology entails regressing foreign industries' export shares on measures of capital and skill intensity in order to obtain an approximation for RCA in capital intensive goods (namely the slope coefficient on capital). The technique relies on regression analysis and therefore are more exposed to measurement error than the RCA indices that we present. Applying these alternative RCA measure in our analysis does not alter the main findings of a generally weak relation.

[9] That is, we assume no factor intensity reversals.

Table 1: Correlations Across Capital Intensity Measures

	U.S. NAICS 1989-2008			**BACI World 1995-2006**		
	k1	k2	k3	k1	k2	k3
Pooled						
$k1$	1.00			1.00		
$k2$	0.56**	1.00		0.54**	1.00	
$k3$	0.65**	0.59**	1.00	0.62**	0.58**	1.00
Cross-Section						
$k1$	1.00			1.00		
$k2$	0.59**	1.00		0.56**	1.00	
$k3$	0.83**	0.69**	1.00	0.78**	0.66**	1.00

Notes: Spearman rank correlation coefficients are reported. A perfect correlation indicates that the two variables in question are perfectly monotonically related. Pooled correlations are calculated over panel data. Cross-section correlations are calculated over averaged data for the period in question. Asterisks **,* indicate significance at 1 and 5 percent levels respectively.

Development Indicators. In addition, oil trade balances are sourced from the International Monetary Fund's World Economic Outlook database. Saving, investment, current accounts and oil trade balances are given as shares of GDP. The youth-old age dependency ratio is defined as the fraction of people younger than 15 and older than 64 years of age in the total population, while trade openness is expressed as exports plus imports in goods and services and is taken as a share of GDP.

Lastly, we note the criteria employed for the selection of our sample of 76 countries. The criteria are adopted from Lane and Milesi-Ferretti (2012). First, we discard all economies with nominal GDP below $20 billion in the year 2007 as small countries can experience high or outsized current account or trade balance volatility. Second, we exclude oil-dominated countries as their external trade dynamics are highly dictated by the price of petroleum. The omission of such countries eliminates extreme outlier observations that could potentially impede any type of meaningful assessment of the relation between macroeconomic outcomes and inter-industry trade dynamics. The final list of countries used is provided in Appendix A, while Appendix B presents a statistical overview of the main variables across countries.[10]

2.2 Methodology

In the first part of our empirical analysis, we gauge basic gross and partial bilateral correlations between revealed comparative advantage and relevant aggregate economic outcomes using cross-sectional data. In

[10]Naturally, data availability also dictates our country sample size.

Table 2: Cross-Country RCA correlations

	U.S. NAICS 1995-2006			BACI World 1995-2006		
	$\overline{\text{RCA}}_1$	$\overline{\text{RCA}}_2$	$\overline{\text{RCA}}_3$	$\overline{\text{RCA}}_1$	$\overline{\text{RCA}}_2$	$\overline{\text{RCA}}_3$
$\overline{\text{RCA}}_1^{NAICS}$	1.00					
$\overline{\text{RCA}}_2^{NAICS}$	0.74**	1.00				
$\overline{\text{RCA}}_3^{NAICS}$	0.91**	0.83**	1.00			
$\overline{\text{RCA}}_1^{World}$	0.62**	0.31**	0.59**	1.00		
$\overline{\text{RCA}}_2^{World}$	0.36**	0.43**	0.47**	0.70**	1.00	
$\overline{\text{RCA}}_3^{World}$	0.50**	0.31**	0.58**	0.86**	0.75**	1.00

Notes: Cross-section correlations are calculated for a sample of 76 countries using averaged data over the period 1995-2006. Spearman rank correlation coefficents are reported. A perfect correlation indicates that the two variables in question are perfectly monotonically related. Asterisks **,* indicate significance at 1 and 5 percent levels respectively.

particular, over the two sample time intervals, we employ country mean and differenced data by averaging individual country series and taking corresponding differences between start and end of period 4-year averages of series. For gross relations, we compute Spearman rank correlation coefficients. The partial correlation is obtained in two steps. The first step entails fitting a linear regression of the relevant macroeconomic outcome variable on the revealed comparative advantage index and other covariates. Thus we estimate

$$\overline{y}_i = \alpha + \beta\overline{RCA}_i + \boldsymbol{\omega}'\overline{\mathbf{x}}_i + \varepsilon_i \quad (3)$$

$$\Delta y_i = \alpha + \beta\Delta RCA_i + \boldsymbol{\omega}'\Delta\mathbf{x}_i + \varepsilon_i \quad (4)$$

where y is one of saving, investment, current account or real GDP per capita growth, and $\mathbf{x}$ is the vector of other covariates including the youth-old dependency ratio, trade openness and the oil trade balance. In the second step, the partial correlation coefficient is then computed as $t_{\hat{\beta}}/\sqrt{t_{\hat{\beta}}^2 + n - k}$ where $t_{\hat{\beta}}$ is the t-statistic corresponding to the estimated RCA coefficient $\hat{\beta}$, n is the number of observations, and k is the number of independent variables, including the constant. Together, these statistics yield some preliminary evidence.

Following Carroll and Weil (1994), Chinn and Prasad (2003), and Lane and Milesi-Ferretti (2012), we next exploit the additional time variation present in our sample by estimating pooled OLS and fixed-effects panel regressions of macroeconomic outcomes on RCA based on non-overlapping 4-year averages of the data for each country. That is, for the panel regressions, the maximum 20 observations available per country in the U.S. NAICS trade-based data are compressed into 5 observations, while the maximum 12 observations available per country in the BACI World trade-based data are compressed into 3 observations. Like in the cross-sectional analysis, we abstract from short-run business cycle variation in the data under such a strategy, which is appropriate given the medium to long-run focus of our study. In particular, allowing for time period dummies, we estimate the non-dynamic reduced-form equations[11]

$$y_{i,t} = \alpha_t + \beta RCA_{i,t} + \boldsymbol{\omega}'\mathbf{x}_{i,t} + \varepsilon_{i,t} \tag{5}$$

$$y_{i,t} = \alpha_{i,t} + \beta RCA_{i,t} + \boldsymbol{\omega}'\mathbf{x}_{i,t} + \varepsilon_{i,t} \tag{6}$$

While the pooled OLS estimates (5) exploit the full cross-sectional variation in the data, it is also important to assess whether results are significantly sensitive to the filtering out of any potential biases arising from country-specific effects such as size. Accordingly, the within panel regression (6) caters to this need by including country dummies that absorb all of the country-specific influences.[12] Finally, we note that our analysis incorporates only a few additional covariates ($\mathbf{x}$) commonly used in the literature in order not to overload the specifications and potentially drive out the significance of RCA.[13]

2.3 Results

2.3.1 Preliminary Cross-Sectional Analysis

Table 3 displays the bilateral gross and partial correlations between RCA and the other relevant macroeconomic variables over the cross section for both the U.S. NAICS and BACI World trade-based datasets. According to basic two-country models of heterogeneous industries, faster growing countries will exhibit notable trade specialization shifts manifested in significantly lower or higher RCAs as economic activity moves towards the labor- or capital-intensive sector, while investment and saving also respond. At the same time, changes in the opposite direction across these variables develop in the slower growing country. That is, the substantial output composition shifts that arise from productivity growth differentials imply that measures of revealed comparative advantage are highly correlated with cross-country differences in saving, investment, external imbalances and GDP growth rates. However, our cross-section results indicate that such strong correlations are largely unobserved in the empirical data. From the table, based on both mean and differenced data, one finds that 84 out of 96 correlations are insignificantly different from zero. Furthermore, the absolute magnitudes of the statistically significant correlations are quite low. As Figures 1 and 2 illustrate, while saving and investment both exhibit relatively strong positive comovements with growth over the cross-section of countries, as well as with one another, no defined correlation

[11]Since we use 4-year averaged data in the estimation, it is unlikely that serial correlation is a problem. Therefore, we do not include the lagged level of the left hand-side variable amongst covariates.

[12]Thus, the preliminary analysis exploits between-country variation, the pooled OLS panel analysis draws on both between- and within-country variation, while the fixed effects panel analysis relies on within-country variation.

[13]We find that increasing the size of vector $\mathbf{x}$ with extra covariates such as international financial integration or capital controls does not affect the main results.

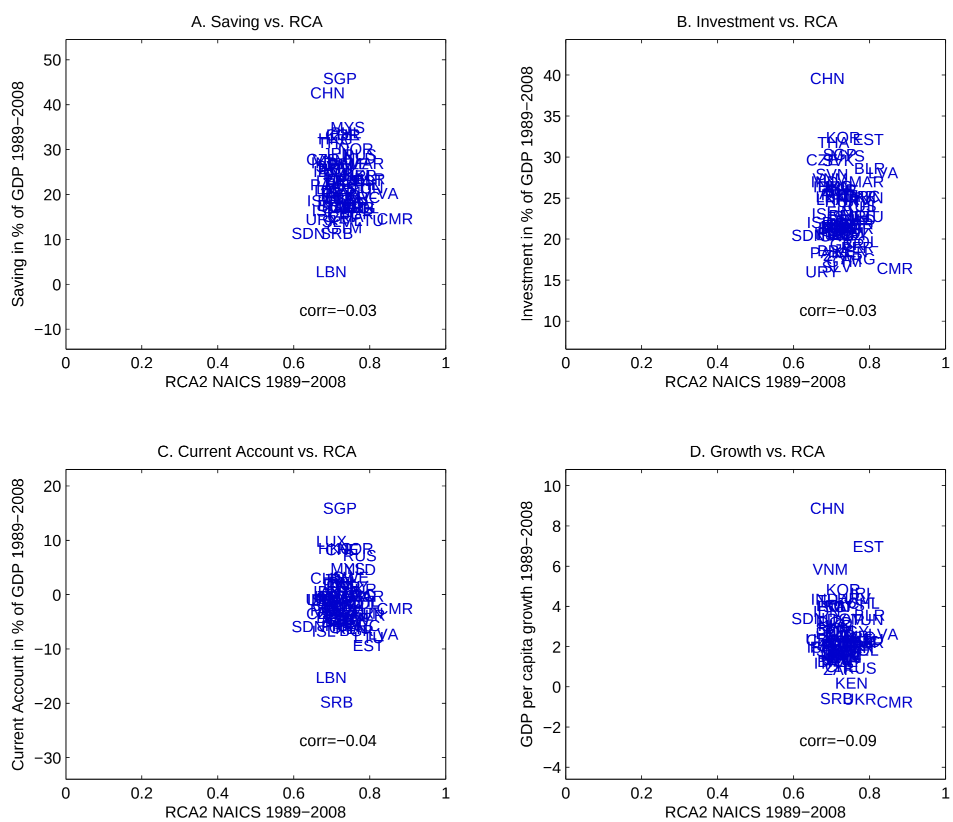
Table 3: Cross-Section Pairwise Gross and Partial Correlations

	$\overline{\left(\frac{S}{Y}\right)}$	$\overline{\left(\frac{I}{Y}\right)}$	$\overline{\left(\frac{CA}{Y}\right)}$	$\overline{g}$	$\Delta\left(\frac{S}{Y}\right)$	$\Delta\left(\frac{I}{Y}\right)$	$\Delta\left(\frac{CA}{Y}\right)$	Δg
Rank Correlation								
k1 $\overline{\text{RCA}}_1^{NAICS}$	0.06	0.07	0.10	−0.21				
k2 $\overline{\text{RCA}}_2^{NAICS}$	−0.03	−0.03	−0.04	−0.09				
k3 $\overline{\text{RCA}}_3^{NAICS}$	0.05	0.08	0.05	−0.13				
k1 $\overline{\text{RCA}}_1^{World}$	0.21	−0.07	0.34**	−0.12				
k2 $\overline{\text{RCA}}_2^{World}$	0.06	−0.19	0.21	−0.28*				
k3 $\overline{\text{RCA}}_3^{World}$	0.16	−0.07	0.31**	−0.19				
k1 $\Delta\text{RCA}_1^{NAICS}$					0.15	−0.00	0.05	−0.17
k2 $\Delta\text{RCA}_2^{NAICS}$					0.09	−0.23	0.31*	−0.14
k3 $\Delta\text{RCA}_3^{NAICS}$					−0.11	0.05	−0.07	0.10
k1 $\Delta\text{RCA}_1^{World}$					−0.06	−0.27**	0.14	−0.05
k2 $\Delta\text{RCA}_2^{World}$					−0.06	−0.31**	0.18	0.06
k3 $\Delta\text{RCA}_3^{World}$					−0.00	0.12	−0.19	−0.19
Partial Correlation								
k1 $\overline{\text{RCA}}_1^{NAICS}$	−0.12	−0.09	−0.10	−0.30*				
k2 $\overline{\text{RCA}}_2^{NAICS}$	−0.10	−0.05	−0.12	−0.15				
k3 $\overline{\text{RCA}}_3^{NAICS}$	−0.15	0.03	−0.21	−0.13				
k1 $\overline{\text{RCA}}_1^{World}$	0.05	−0.24	0.19	−0.28*				
k2 $\overline{\text{RCA}}_2^{World}$	0.02	−0.30*	0.18	−0.28*				
k3 $\overline{\text{RCA}}_3^{World}$	0.09	−0.21	0.16	−0.27*				
k1 $\Delta\text{RCA}_1^{NAICS}$					0.14	0.13	0.02	−0.09
k2 $\Delta\text{RCA}_2^{NAICS}$					0.11	0.02	0.16	−0.04
k3 $\Delta\text{RCA}_3^{NAICS}$					0.04	0.18	−0.04	0.04
k1 $\Delta\text{RCA}_1^{World}$					0.14	−0.18	0.00	−0.05
k2 $\Delta\text{RCA}_2^{World}$					−0.00	−0.29*	0.15	0.03
k3 $\Delta\text{RCA}_3^{World}$					0.08	0.27*	−0.26	−0.15

Notes: The cross-section correlations are calculated for a sample of 76 countries using the period 1995-2006 in the case of BACI World trade data (*World*) and 1989-2008 in the case of US NAICS trade data (*NAICS*). $\overline{x}$ denotes the mean of x while Δx denotes the change in the non-overlapping 4-year average of x between the start and end of the relevant time period. The first panel shows the Spearman correlation coefficients. In the second panel the relevant linear regression is first fitted (controls: demographics, trade openness, oil balance) and then the partial correlation coefficient is calculated as $t/\sqrt{t^2+n-k}$ where t is the corresponding t-statistic, n is the number of observations, and k is the number of independent variables, including the constant. Asterisks **,* indicate significance at 1 and 5 percent levels respectively.

is apparent between either saving or investment and RCA.[14] In particular, Figure 1 suggests that we do not observe the predicted strong inter-industry trade dynamics during episodes of growth discrepancies. We also note that the empirical evidence from Figure 2 indicating a positive link between saving and growth, a positive correlation between saving and investment, and a zero correlation between the current account and growth contrasts significantly with the correlations predicted by standard models. To be exact, the standard models alluded to in our paper predict negative correlations in all three cases.

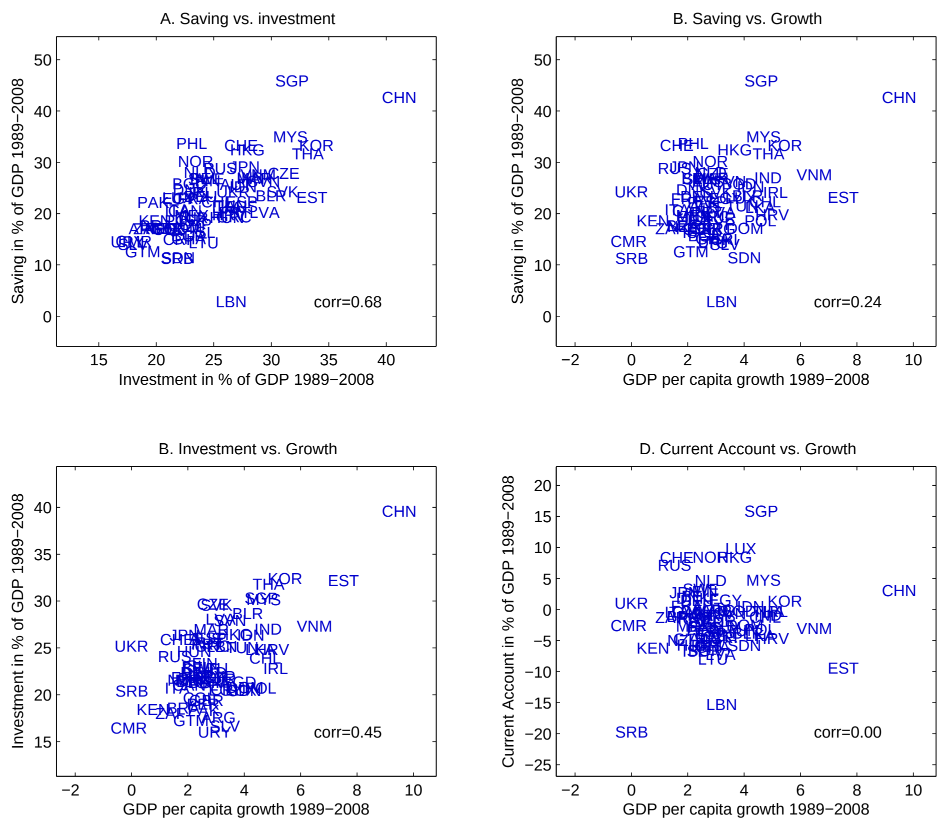
Figure 1: RCA vs. each of Saving, Investment, Current Account, and Growth, 1989-2008 Cross Section



Notes: The cross-country data pertain to cross-section averages over the period 1989-2008 in the case of the U.S. NAICS trade-based dataset. The RCA index is based on the capital intensity measure from equation (2b). Spearman rank correlations reported.

[14] To focus attention and illustrate our point, Figure 1 shows the plots for only one of the RCA variables, namely the RCA based on U.S. NAICS trade data and the capital intensity measure in equation (2b). Similar graphical patterns hold for RCAs based on BACI World trade data and the different capital intensity measures. While the capital intensity definition for the plotted RCA is standard in the literature, the NBER-CES value added data typically used in its construction are mismeasured. Specifically, the NBER-CES value added contain service intermediates and are therefore inflated. Thus, the corresponding capital intensity values should be scaled down. This is another reason why we provide alternative measures of capital intensities that require different data.

Figure 2: Correlations Between Saving, Investment, Current Accounts and Growth, 1989-2008 Cross Section



Notes: The cross-country data pertain to cross-section averages over the period 1989-2008. Spearman rank correlations reported. All correlations apart from that between the current account and GDP per capita growth are statistically significant at the 1 percent level.

2.3.2 Panel Regression Analysis

Inspection of the central correlations using panel data yields findings similar to those obtained in the cross section. Tables 4 and 5 show the pooled OLS and fixed effects panel regression results respectively across our two datasets. As can be observed across the various specifications, the absolute magnitudes of the estimated RCA coefficients are very low with the majority of correlations showing to be insignificantly different from zero at the 5 percent level. Specifically, only 5 statistically significant estimates are found from the 24 pooled regressions, while no significant estimates can be found from the 24 country fixed effects regressions. Again, such weak correlations fly in the face of predictions emanating from standard models of industry heterogeneity in labor intensity and productivity.

Table 4: Pooled OLS Panel Regressions with non-overlapping 4-year average data

		$\left(\frac{S}{Y}\right)$	$\left(\frac{I}{Y}\right)$	$\left(\frac{CA}{Y}\right)$	g	$\left(\frac{S}{Y}\right)$	$\left(\frac{I}{Y}\right)$	$\left(\frac{CA}{Y}\right)$	g	$\left(\frac{S}{Y}\right)$	$\left(\frac{I}{Y}\right)$	$\left(\frac{CA}{Y}\right)$	g
U.S. NAICS trade data 1989-2008													
k1	$\overline{\text{RCA}}_1^{NAICS}$	−0.01	−0.01	−0.00	−0.00								
		(0.01)	(0.01)	(0.01)	(0.00)								
k2	$\overline{\text{RCA}}_2^{NAICS}$					−0.14	−0.02	−0.14	0.05				
						(0.13)	(0.11)	(0.10)	(0.04)				
k3	$\overline{\text{RCA}}_3^{NAICS}$									−0.03	0.01	−0.04*	0.01
										(0.02)	(0.02)	(0.02)	(0.01)
	additional controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
	fixed effects	no	no	no	no	no	no	no	no	no	no	no	no
	time dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
	observations	304	306	306	306	304	306	306	306	304	306	306	306
	R^2	0.35	0.24	0.30	0.11	0.35	0.23	0.31	0.12	0.35	0.24	0.34	0.13
BACI World trade data 1995-2006													
k1	$\overline{\text{RCA}}_1^{World}$	0.01	−0.03*	0.02*	−0.01								
		(0.02)	(0.01)	(0.01)	(0.01)								
k2	$\overline{\text{RCA}}_2^{World}$					−0.03	−0.41**	0.24	−0.13				
						(0.22)	(0.14)	(0.14)	(0.08)				
k3	$\overline{\text{RCA}}_3^{World}$									0.06	−0.12	0.09	−0.07*
										(0.13)	(0.08)	(0.05)	(0.03)
	additional controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
	fixed effects	no	no	no	no	no	no	no	no	no	no	no	no
	time dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
	observations	197	198	198	198	197	198	198	198	197	198	198	198
	R^2	0.37	0.28	0.35	0.19	0.36	0.29	0.34	0.18	0.37	0.26	0.34	0.20

Notes: Non-overlapping 4-year average data are employed for a sample of 76 countries using the period 1995-2006 in the case of BACI World trade data (*World*) and 1989-2008 in the case of US NAICS trade data (*NAICS*). Asterisks **,* indicate significance at 1 and 5 percent levels respectively. Standard errors in parentheses. Additional control variables: youth-old dependency ratio, trade openness, oil balance.

Table 5: Fixed Effects Panel Regressions with non-overlapping 4-year average data

		$\left(\frac{S}{Y}\right)$	$\left(\frac{I}{Y}\right)$	$\left(\frac{CA}{Y}\right)$	g	$\left(\frac{S}{Y}\right)$	$\left(\frac{I}{Y}\right)$	$\left(\frac{CA}{Y}\right)$	g	$\left(\frac{S}{Y}\right)$	$\left(\frac{I}{Y}\right)$	$\left(\frac{CA}{Y}\right)$	g
U.S. NAICS trade data 1989-2008													
k1	$\overline{\text{RCA}}_1^{NAICS}$	0.00	−0.00	−0.00	0.00								
		(0.01)	(0.01)	(0.01)	(0.00)								
k2	$\overline{\text{RCA}}_2^{NAICS}$					0.11	0.02	0.07	0.02				
						(0.06)	(0.08)	(0.07)	(0.06)				
k3	$\overline{\text{RCA}}_3^{NAICS}$									0.00	0.02	−0.02	0.01
										(0.01)	(0.01)	(0.01)	(0.01)
	additional controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
	fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
	time dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
	observations	304	306	306	306	304	306	306	306	304	306	306	306
	within R^2	0.12	0.12	0.08	0.24	0.12	0.11	0.09	0.24	0.12	0.13	0.09	0.24
BACI World trade data 1995-2006													
k1	$\overline{\text{RCA}}_1^{World}$	0.02	−0.05	0.01	−0.01								
		(0.04)	(0.03)	(0.03)	(0.01)								
k2	$\overline{\text{RCA}}_2^{World}$					−0.12	−0.32	0.01	0.05				
						(0.18)	(0.23)	(0.25)	(0.11)				
k3	$\overline{\text{RCA}}_3^{World}$									0.03	0.17	−0.17	−0.04
										(0.10)	(0.10)	(0.09)	(0.06)
	additional controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
	fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
	time dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
	observations	197	198	198	198	197	198	198	198	197	198	198	198
	within R^2	0.20	0.23	0.14	0.34	0.20	0.21	0.13	0.33	0.19	0.22	0.16	0.34

Notes: Non-overlapping 4-year average data are employed for a sample of 76 countries using the period 1995-2006 in the case of BACI World trade data (*World*) and 1989-2008 in the case of US NAICS trade data (*NAICS*). Asterisks **,* indicate significance at 1 and 5 percent levels respectively. Standard errors in parentheses. Additional control variables: youth-old dependency ratio, trade openness, oil balance.

2.3.3 Consolidated Summary

Using different trade datasets in the context of both cross-sectional and longitudinal studies for a large sample of developed and developing economies, we find no robust empirical evidence in favor of the strong correlations between inter-industry trade dynamics and aggregate economic indicators predicted by standard models of industry heterogeneity. To be exact, models of this variety indicate that persistent growth differentials between countries will be associated with significant shifts in trade specialization patterns. This implies that RCA measures across countries will exhibit substantial fluctuations as national economic activity in tradables becomes skewed towards either the labor- or capital-intensive sector. Therefore, cross-country differences in RCA should comove strongly with cross-country discrepancies in growth, saving, investment and current accounts.

In the remainder of the paper, we demonstrate how a model with intra-industry trade can explain the absence of such correlations in the data. As we show, the empirical evidence can be accounted for as follows. First, investment rates in the faster growing country increase in order to bring down returns to capital. However, they do not increase by as much as in the neoclassical model because investment is partially non-tradable. Second, saving are determined by the interplay of two mechanisms. On the one hand, given that domestic goods cannot be simply substituted by goods from abroad, the faster growing country's saving need to increase to provide the domestic goods required for higher investment in the intra-industry model. On the other hand, consumers in the faster growing country also want to increase current consumption in order to spread the benefits from higher future income over time. Importantly, this borrowing against higher future income motive is attenuated in the intra-industry model. Once again, this arises due to the low substitutability between domestic and foreign goods. The consumer in the faster growing economy wishes to consume more of all varieties and therefore does not borrow against future income as much as the neoclassical model would predict. As a result of these two mechanisms, saving rise in the faster growing country. With such developments, one observes a positive correlation between investment and saving. Third, and finally, the introduction of intra-industry trade suppresses inter-industry trade dynamics, implying that the RCA response remains relatively flat under cross-country growth differentials. That is, shifting production location along comparative advantage lines in order to gain from trade specialization would culminate in a loss of varieties, which, as noted, is neither favorable for consumers nor investors.

3 The Model

Consider a world with two country groups, Home and Foreign, each populated by an infinitely-lived representative consumer. Both countries produce two tradable intermediate goods, A and B, and one non-tradable good N. Each good is produced with two inputs, capital (K) and labor (L). Adjustment costs are incurred when the capital stock is changed. Capital can move within and between countries, while labor can only move within countries. The tradable goods can be traded between countries at zero cost. A single bond is traded between countries. The source of exogenous dynamics is a country-specific shock to the growth rate of labor productivity. The two key model assumptions are: i) a difference in the capital intensity of tradable goods gives rise to gains from trade specialization, and ii) Home and Foreign produce imperfectly substitutable varieties of the tradable goods A and B which gives rise to gains from intra-industry trade.

3.1 Firms

A representative firm in the perfectly competitive sector $n \in \{A, B, N\}$ of country $i \in$ {Home, Foreign} produces the output of good n at time t, $F^i_{t,n}$, using a combination of capital and labor inputs. Specifically, this output is given by the Cobb-Douglas production function

$$F^i_{n,t} = [K^i_{n,t}]^{\alpha_n} [\Gamma^i_t L^i_{n,t}]^{1-\alpha_n} \tag{7}$$

where $\Gamma^i_t = e^{g^i_t} \Gamma^i_{t-1} = \prod_{s=0}^{t} e^{g^i_s}$ represents the technology level of country i at time t which is dependent on the history of the labor productivity growth rate, g^i_s, since period 0, and $\alpha_n \in (0, 1)$ denotes the capital intensity of sector n. The first key assumption in the model is that the capital intensity differs across tradable sectors. This heterogeneity in production technologies gives rise to gains from trade specialization during episodes of growth differentials between countries.

Assumption 1. *The capital intensity differs across the tradable goods A and B with $\alpha_A > \alpha_B$.*

In assuming that productivity growth is labor-augmenting in the long-run, we are consistent with the works of Uzawa (1961), Jones (2005), and Acemoglu (2002).[15] The labor productivity growth rate g follows the stochastic first-order autoregressive process

$$g^i_t = (1 - \rho)\mu + \rho g^i_{t-1} + \epsilon^i_t \tag{8}$$

where ϵ^i_t is the country-specific, independently and identically normally distributed random shock with zero-mean and constant variance, μ is the long run productivity growth rate that both country groups have in common, and ρ is the parameter that governs the persistence of the stochastic shock ϵ^i_t and thus the persistence of growth rate deviations from the long-run level μ.[16] As the model exhibits trend growth,

[15] Relying on labor-augmenting productivity growth stabilizes the long-run shares of the heterogeneous industries in output. In closed economy models, stabilizing these shares induces balanced growth in the long-run.

[16] We choose a shock structure to mimic persistent growth differentials between countries. This shock structure allows us to generate a simplified laboratory-like environment of two different country groups: fast and slow growing countries. The selection is motivated by the fact that growth differentials across countries are a pervasive empirical phenomenon. Figure 2, for example, shows that growth differentials are the underlying pattern behind cross-country differences in saving and investment rates.

we normalize all relevant variables by the long-run growth rate of the system in order to induce model stationarity. We follow Aguiar and Gopinath (2007) by using the level of productivity to de-trend the system of equations. In particular, $\hat{x}_t$ denotes the de-trended variable x_t, and is defined as

$$\hat{x}_t \equiv \frac{x_t}{\Gamma^{\neg i}_{t-1}}, \tag{9}$$

where $\Gamma^{\neg i}_{t-1}$ is the lagged productivity level of country $\neg i$.[17]

3.2 Industry Structure

A final good, Y^i_t, is used for both consumption, C^i_t, and investment, I^i_t in country i at time t

$$\hat{Y}^i_t \equiv \hat{I}^i_t + \hat{C}^i_t. \tag{10}$$

The final good, Y^i_t, consists of both tradable and non-tradable intermediate goods

$$\hat{Y}_{i,t} = \left[\gamma_{NT}^{\frac{1}{\theta_{NT}}}\left[\hat{Y}_{i,T,t}\right]^{1-\frac{1}{\theta_{NT}}} + (1-\gamma_{NT})^{\frac{1}{\theta_{NT}}}\left[\hat{Y}_{i,N,t}\right]^{1-\frac{1}{\theta_{NT}}}\right]^{\frac{\theta_{NT}}{\theta_{NT}-1}} \tag{11}$$

where $Y^i_{T,t}$ and $Y^i_{N,t}$ denote the amounts of the tradable and non-tradable goods used respectively in country i at time t. The share of the tradable good in the final good is given by γ_{NT}. The elasticity of substitution between tradable and non-tradable goods is given by θ_{NT}. The tradable good, $Y^i_{T,t}$, consists of both capital and labor intensive intermediate goods

$$\hat{Y}_{i,T,t} = \left[\gamma_{AB}^{\frac{1}{\theta_{AB}}}\left[\hat{Y}_{i,A,t}\right]^{1-\frac{1}{\theta_{AB}}} + (1-\gamma_{AB})^{\frac{1}{\theta_{AB}}}\left[\hat{Y}_{i,B,t}\right]^{1-\frac{1}{\theta_{AB}}}\right]^{\frac{\theta_{AB}}{\theta_{AB}-1}} \tag{12}$$

where $Y_{i,A,t}$ and $Y_{i,B,t}$ denote the amounts of the capital and labor intensive goods used respectively in country i at time t. The share of the capital intensive tradable good in the aggregate tradable good is given by γ_{AB}. The elasticity of substitution between capital and labor intensive tradable goods is given by θ_{AB}. Both capital and labor intensive goods are produced as Home and Foreign varieties which are imperfect substitutes. Formally

$$\hat{Y}_{i,A,t} = \left[\gamma_{i,t}^{\frac{1}{\theta_{HF}}}\left[\hat{Y}^i_{i,A,t}\right]^{1-\frac{1}{\theta_{HF}}} + (1-\gamma_{i,t})^{\frac{1}{\theta_{HF}}}\left[\hat{Y}^{\neg i}_{i,At}\right]^{1-\frac{1}{\theta_{HF}}}\right]^{\frac{\theta_{HF}}{\theta_{HF}-1}} \tag{13}$$

[17] We re-scale by trend productivity through period $t-1$ as this ensures that $\hat{x}_t$ is in the agent's information set as of time $t-1$ given the presence of x_t in the set. In the simulations below, country $\neg i$ is the faster growing country.

$$\hat{Y}_{i,B,t} = \left[\gamma_{i,t}^{\frac{1}{\theta_{HF}}} \left[\hat{Y}_{i,B,t}^{i} \right]^{1-\frac{1}{\theta_{HF}}} + (1-\gamma_{i,t})^{\frac{1}{\theta_{HF}}} \left[\hat{Y}_{i,Bt}^{\neg i} \right]^{1-\frac{1}{\theta_{HF}}} \right]^{\frac{\theta_{HF}}{\theta_{HF}-1}} \tag{14}$$

where $Y_{i,A,t}^{i}$ and $Y_{i,B,t}^{i}$ denote country i's use of the variety produced in country i, while $Y_{i,At}^{\neg i}$ and $Y_{i,Bt}^{\neg i}$ denote country i's use of of the variety produced in country $\neg i$. The share of the domestically produced good is given by $\gamma_{i,t}$.[18]

The elasticity of substitution between domestically produced and imported varieties is given by θ_{HF}. The assumption that Home and Foreign varieties are imperfect substitutes in final consumption and investment is the second key assumption. This assumption gives rise to gains from intra-industry trade.

Assumption 2. *Home and Foreign varieties of tradable goods A and B are imperfect substitutes with* $\theta_{HF} << \infty$.

As we will see in the simulations of Section 4, this second assumption is central to our argument. If the different tradable goods are imperfect substitutes across countries, gains from trade specialization are low during episodes of relative productivity growth between countries. If different tradable goods are perfect substitutes across countries, gains from trade specialization are high during episodes of relative productivity growth between countries.

3.3 Relative Prices and Revealed Comparative Advantage

The nominal exchange rate of country $\neg i$ is equal to the inverse of the nominal exchange rate of country i. Formally

$$\xi_t^{\neg i} = 1/\xi_t^{i}. \tag{15}$$

We normalize the domestic price of good A to unity, i.e. $P_{A,\neg i}^{\neg i} = P_{A,i}^{i} = 1$. The price of the imported good A in country i is, thus, equal to ξ_t^{i}. The price of the imported good A in country $\neg i$ is, thus, equal to $\xi_t^{\neg i}$. The price of the imported good B in country i, $P_{B,i}^{\neg i}$, is equal to the domestic price of good B in country $\neg i$, $P_{B,\neg i}^{\neg i}$, times the exchange rate of country i. In particular

$$P_{B,\neg i}^{i} = P_{B,i}^{i} \times \xi_t^{\neg i} \quad \text{and} \quad P_{B,i}^{\neg i} = P_{B,\neg i}^{\neg i} \times \xi_t^{i}. \tag{16}$$

We can back out the measure of revealed comparative advantage used in the empirical analysis above directly from the theory. The revealed comparative advantage of countries i and $\neg i$ is an export weighted

[18] $\gamma_{i,t} = 1 - z \times \Gamma_t^{\neg i}/(\Gamma_t^{i} + \Gamma_t^{\neg i})$, where z is an indicator of home bias. The term $\Gamma_t^{\neg i}/(\Gamma_t^{i} + \Gamma_t^{\neg i})$ is a country size adjustment that has no particular economic interpretation. If Home is twice as large as Foreign and Foreign imports 5% of its GDP from Home, then Home imports 2.5% of its GDP from Foreign in a zero net trade equilibrium.

average of the capital intensities. That is

$$RCA^i = \alpha_A \times \frac{\xi_t^{\neg i} P_{A,i}^i Y_{A,\neg i}^i}{\xi_t^{\neg i} P_{A,i}^i Y_{A,\neg i}^i + \xi_t^{\neg i} P_{B,i}^i Y_{B,\neg i}^i} + \alpha_B \times \frac{\xi_t^{\neg i} P_{B,i}^i Y_{B,\neg i}^i}{\xi_t^{\neg i} P_{A,i}^i Y_{A,\neg i}^i + \xi_t^{\neg i} P_{B,i}^i Y_{B,\neg i}^i} \tag{17}$$

$$RCA^{\neg i} = \alpha_A \times \frac{\xi_t^{i} P_{A,\neg i}^{\neg i} Y_{A,i}^{\neg i}}{\xi_t^{i} P_{A,\neg i}^{\neg i} Y_{A,i}^{\neg i} + \xi_t^{i} P_{B,\neg i}^{\neg i} Y_{B,i}^{\neg i}} + \alpha_B \times \frac{\xi_t^{i} P_{B,\neg i}^{\neg i} Y_{B,i}^{\neg i}}{\xi_t^{i} P_{A,\neg i}^{\neg i} Y_{A,i}^{\neg i} + \xi_t^{i} P_{B,\neg i}^{\neg i} Y_{B,i}^{\neg i}}. \tag{18}$$

3.4 Consumers

The representative consumer in country i has the present discounted value of lifetime utility from consumption

$$U_t^i = E_t \sum_{s=0}^{\infty} \beta^{t+s} \left(\Gamma_{t-1+s}^{\neg i}\right)^{1-\phi} \frac{\hat{C}_{i,t+s}^{1-\phi}}{1-\phi} \tag{19}$$

and faces the budget constraint in country i,

$$\sum_n \hat{w}_{n,t}^i L_{n,t}^i + \sum_n r_{n,t}^i \hat{K}_{n,t}^i = P_t^i \hat{I}_t^i + P_t^i \hat{C}_t^i + \frac{1-\psi_B \hat{B}_t^{\neg i}}{1+r_t^B} e^{g_t^{\neg i}} \hat{B}_{t+1}^i - \hat{B}_t^i. \tag{20}$$

where $w_{n,t}^i$ is the return to labor, $r_{n,t}^i$ is the return to capital, P_t^i is the price of the final good, B_t^i denote holdings of a single internationally traded risk-free bond, and ζ_t^i is the time t present value price of a unit of international bond holdings in period $t+1$. In country $\neg i$ the budget constraint takes a slightly different form since we assume that only a single bond is traded between countries:

$$\sum_n \hat{w}_{n,t}^{\neg i} L_{n,t}^{\neg i} + \sum_n r_{n,t}^{negi} \hat{K}_{n,t}^{\neg i} = P_t^{\neg i} \hat{I}_t^{\neg i} + P_t^{\neg i} \hat{C}_t^{\neg i} + \zeta_t^{\neg i} + \xi_t^{\neg i} \frac{1}{1+r_t^B} e^{g_t^{\neg i}} \hat{B}_{t+1}^i - \xi_t^{\neg i} \hat{B}_t^i. \tag{21}$$

The corresponding transversality conditions are assumed to hold. The overall labor supply, which is allocated across sectors by the consumer, is given exogenously. Formally, we have

$$L_t^i \equiv 1 = \sum_{n=A,B,N} L_{n,t}^i. \tag{22}$$

The capital stock evolves over time subject to the following capital adjustment technology[19]

$$e^{g_t^{\neg i}} \hat{K}_{n,t+1}^i = (1-\delta)\hat{K}_{n,t}^i + \hat{I}_{n,t}^i - \frac{\psi_K}{2}\left[e^{g_t^{\neg i}} \frac{\hat{K}_{n,t+1}^i}{\hat{K}_{n,t}^i} - e^{\mu_g}\right]^2 \hat{K}_{n,t}^i. \tag{23}$$

where δ denotes the depreciation rate and the parameter ψ_K affects the cost of adjustment for capital. We also note that, in our system, the law of motion for bonds is non-stationary.

[19] This adjustment equation is a modification of the more common capital adjustment costs term used, for example, in Baxter and Crucini (1993). The modification is needed because the model exhibits positive trend growth. With the standard capital accumulation equation, there would be adjustment costs in steady state. The modification employed here is taken from Aguiar and Gopinath (2007).

3.5 Equilibrium

A competitive equilibrium is described by the quantities $\{\hat{Y}^i_t,\ \hat{Y}^i_{T,t},\ \hat{Y}^i_{N,t},\ \hat{Y}^i_{A,t},\ \hat{Y}^i_{B,t},\ \hat{Y}^i_{i,A,t},\ \hat{Y}^i_{i,B,t},\ \hat{Y}^{\neg i}_{i,A,t},\ \hat{Y}^{\neg i}_{i,B,t},\ \hat{C}^i_t,\ \hat{I}^i_t,\ \hat{I}^i_{n,t},\ \hat{K}^i_{n,t},\ L^i_{n,t},\ \hat{B}^i_t\}^{\infty}_{t=0}$ and prices $\{\hat{w}^i_{n,t},\ r^i_{n,t},\ P^i_{n,t},\ \zeta^i_t,\ \xi^i_t\}^{\infty}_{t=0}$ $\forall$ $n = \{A, B, N\}$ and $i = \{\text{Home}, \text{Foreign}\}$ given the levels of productivity, $\{\Gamma^i_t\}^{\infty}_{t=0}$, and labor, L^i, such that 1) $\hat{K}^i_{n,t}, L^i_{n,t}$ maximize the profits of firm n in country i taking $P^i_{n,t}, \hat{w}^i_{n,t}$ and $r^i_{n,t}$ as given. 2) $\hat{C}^i_{t+s},\ L^i_{n,t+s},\ \hat{K}^i_{n,t+s+1},\ \hat{I}^i_{n,t+s}, \hat{B}^i_{t+s+1}$ maximize expected lifetime utility of country i's representative consumer. 3) $\hat{Y}^i_{T,t}, \hat{Y}^i_{N,t}, \hat{Y}^i_{A,t}, \hat{Y}^i_{B,t}, \hat{Y}^i_{i,A,t}, \hat{Y}^i_{i,B,t}, \hat{Y}^{\neg i}_{i,A,t}, \hat{Y}^{\neg i}_{i,B,t}$ solve consumer i's intratemporal problems. 4) All markets clear.

4 Quantitative Analysis

In the analysis that follows, we numerically explore the model presented in Section 3. To illustrate the main mechanism, we concentrate on Assumption 2. We mimic the empirical environment described in Section 2, in which one country group grows faster than the other, by simulating a persistent shock to trend productivity growth in Foreign. We take a first-order approximation of the stationary model. By adding the trend back to the model, we can back out the non-stationary model. That is, given a solution to the normalized equations, we can retrieve the path of the non-normalized equilibrium by multiplying through by $\Gamma^{\neg i}_{t-1}$. We start the simulations from a deterministic, symmetric-countries steady state that is uniquely defined by the exogenously given level of productivity and by the endowment of labor. In particular, $\epsilon^i_t = 0$ in steady state so that the growth rate is time invariant with $g^i_t = g^i_{t-1} = \ldots = g^i = \mu$.

4.1 Parameters

To simulate the model, we employ a set of standard parameter values. Table 6 shows these parameters. Noting the estimates of Hall (1988), Campbell (2003) and Vissing-Jorgensen (2002) which suggest that the intertemporal elasticity of substitution is well below unity, we set ϕ to 2. The discount factor β is fixed at 0.97, while the depreciation rate δ assumes a value of 0.09. The debt elasticity parameter ψ_B is set to .001 following Schmitt-Grohe and Uribe (2003) and Neumeyer and Perri (2005). For capital adjustment costs, we assume $\psi_K = 2$. Appendix C demonstrates the robustness of our results under higher capital adjustment costs with $\psi_K = 4$ as in Aguiar and Gopinath (2007). Table 7 provides a breakdown of the U.S. economy into different sectors and their corresponding capital intensities. From this decomposition, we infer the capital intensities and output shares. Accordingly, we set the capital intensities to $\alpha_A = 0.65$, $\alpha_B = 0.29$ and $\alpha_N = 0.47$. These capital weights are calculated based on the compensation of employees in value added. Thus, they do not account for the labor income of the self-employed. In Appendix C we show the robustness of our results in the presence of a lower overall capital share that is in line with Gollin (2002)'s aggregate capital share estimates of around 0.33. Based on Table 7, we set $\gamma_{AB} = 0.5$ and $\gamma_{NT} = 0.2$. We assume a home bias in trade and specify $\gamma_{HF} = 0.7$. In Appendix C, we show the insensitivity of our results to a lower non-tradable share $\gamma_{NT} = 0.5$, no home bias via $\gamma_{HF} = 0.5$, and a combination of the two former features.

Table 6: Parameters

consumers	$\beta = 0.97$, $\phi = 2$
industry structure	$\gamma_{AB} = 0.5$, $\gamma_{NT} = 0.2$, $\gamma_{HF} = 0.7$
	$\theta_{AB} = 0.5$, $\theta_{NT} = 0.5$, $\theta_{HF} \in \{1.75, 500\}$
firms	$\alpha_A = 0.65$, $\alpha_B = 0.29$, $\alpha_N = 0.47$, $\delta = 0.09$
adjustment costs	$\psi_K = 2$
stochastic process	$\rho_g = 0.9$, $\mu = 0.023$
bonds	$\psi_B = 0.001$

The key parameters that drive our results are the goods elasticities within the tradable sector. Following Coeurdacier (2009), Acemoglu and Guerrieri (2008) and Stockman and Tesar (1995) who assume that the elasticity of substitution between different goods is well below unity, we set θ_{NT} and θ_{AB} equal to 0.5, reflecting gross complementarity between goods. Assigning a low θ_{AB} is plausible given that capital and labor intensive tradable goods strongly overlap with durable and non-durable goods which exhibit very different characteristics. For the elasticity between Home and Foreign goods, we select $\theta_{HF} = 1.75$. Estimating Armington elasticities from U.S. data, Feenstra et al. (2014) find a macro elasticity of around 1.75. An elasticity estimate of below 2 is commonly utilized in the international real business cycle literature; see for instance Heathcote and Perri (2002), Backus et al. (1994) and Ruhl (2008). In Appendix C we illustrate the robustness of our results under the assumption of higher elasticities.

Finally, to study persistent growth differentials across countries, we set the persistence of growth shocks, ρ, to 0.9. Appendix C exhibits the robustness of our results to an even greater persistence of $\rho = 0.95$. The long-run growth rate is set to match the real GDP per capita growth rate of developed countries over the period 1989-2008, namely $\mu = 0.02$. We simulate an unexpected growth shock to Foreign of 3 percentage points in order to approximately parallel the 5 percent growth rate of developing countries in our sample over the interval 1989-2008.

4.2 Simulation Results

Figure 3 displays the impulse responses of both Home and Foreign to a persistent but unexpected three percentage point increase in Foreign's productivity growth rate. The upper half of the Figure shows the simulation results in the case of potential gains from inter-industry trade, with $\theta_{HF} = 500$.[20] The lower half of the Figure shows the simulation results in the case of potential gains from both inter and intra-industry trade, with $\theta_{HF} = 1.75$. We use these two contrasting setups to derive our main result: in the presence of gains from intra-industry trade, the gains from inter-industry trade are rather low.

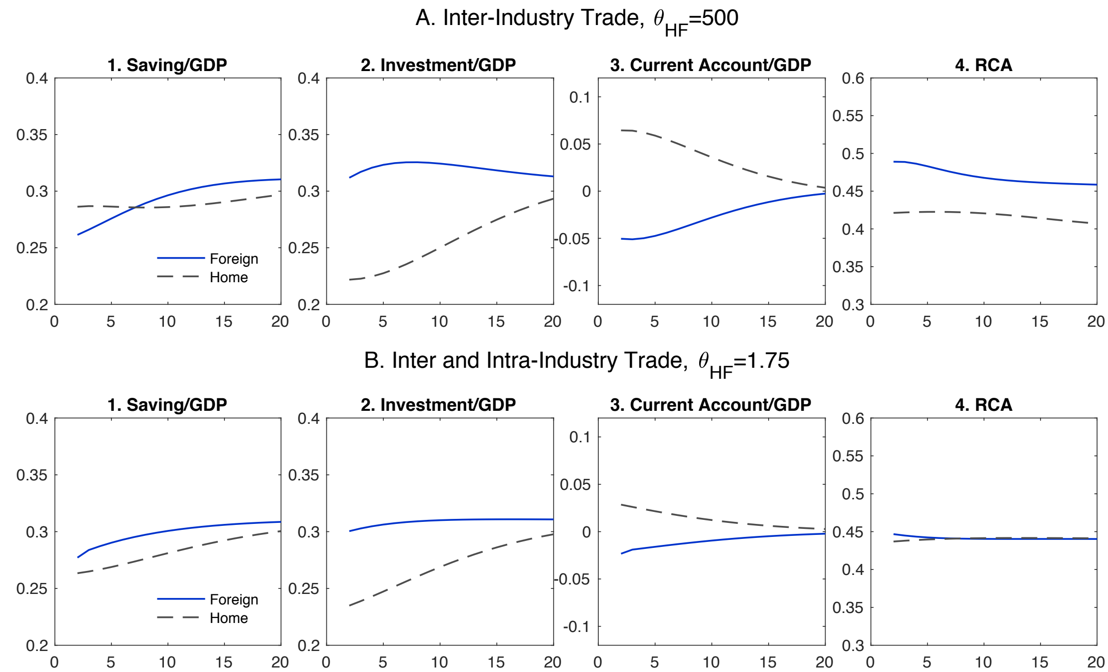
[20] $\theta_{HF} = 500$ is a proxy for an infinite elasticity of substitution between Home and Foreign tradable varieties.

Table 7: Average Capital Intensities and Output Shares 1989-2008 of NAICS Industries

industry	NAICS	α_z	P_zY_z/PY	industry	NAICS	α_z	P_zY_z/PY
N Real estate	531	0.95	12.84 %	A Farms	111	0.79	1.06 %
N Rental, leasing etc.	532	0.83	1.49 %	A Petroleum, coal	324	0.78	0.80 %
N Broadcasting, telecom.	513	0.64	2.89 %	A Oil, gas extraction	211	0.78	0.97 %
N FED, credit intermediation	521	0.58	3.92 %	A Utilities	22	0.75	2.25 %
N Pipeline transportation	486	0.58	0.11 %	A Chemical products	325	0.55	1.88 %
N Water transportation	483	0.51	0.10 %	A Food, beverages, tobacco	311	0.54	1.82 %
N Motion picture, recording	512	0.50	0.47 %	A Mining, except oil and gas	212	0.53	0.36 %
N Funds, trusts, other vehicles	525	0.50	0.25 %	A Forestry, fishing etc.	113	0.52	0.27 %
N Wholesale trade	42	0.47	6.86 %	A Paper products	322	0.43	0.65 %
N Legal services	5411	0.47	1.65 %	B Miscellaneous manufacturing	339	0.39	0.65 %
N Insurance carriers	524	0.45	2.87 %	B Electrical equipment etc.	335	0.37	0.52 %
N Arts, entertainment	71	0.44	1.06 %	B Plastics, rubber	326	0.37	0.68 %
N Retail trade	44-45	0.42	7.77 %	B Nonmetallic mineral products	327	0.36	0.45 %
N Transit, transportation	485	0.40	0.20 %	B Primary metals	331	0.31	0.56 %
N Publishing industries	511	0.40	1.19 %	B Fabricated metal products	332	0.31	1.28 %
N Truck transportation	484	0.38	1.06 %	B Machinery	333	0.29	1.22 %
N Accommodation, food	72	0.38	3.19 %	B Textile mills, textile product mills	313	0.27	0.31 %
N Miscellaneous services	5412	0.37	4.71 %	B Furniture and related products	337	0.26	0.34 %
N Other services	81	0.36	2.99 %	B Apparel, leather products	315	0.26	0.26 %
N Support activities for mining	213	0.34	0.23 %	B Motor vehicles, bodies, trailers etc.	3351	0.26	1.17 %
N Construction	23	0.33	5.09 %	B Wood products	321	0.26	0.32 %
N Other transportation	487	0.32	0.80 %	B Other transportation equipment	3364	0.24	0.80 %
N Air transportation	481	0.32	0.59 %	B Computer and electronic products	334	0.23	1.77 %
N Information, data processing	514	0.31	0.51 %	B Printing, related support activities	323	0.14	0.44 %
N Rail transportation	482	0.27	0.28 %				
N Administrative, waste management	561, 562	0.27	3.05 %				
N Warehousing, storage	493	0.21	0.30 %	A Capital intensive tradable		0.65	10.05 %
N Health care, social assistance	62	0.19	7.32 %	B Labor intensive tradable		0.29	10.78 %
N Management	55	0.13	1.86 %	N Non-tradable		0.47	79.17 %
N Educational services	61	0.12	1.01 %				
N Securities, commodity contracts	523	0.11	1.41 %	Private industries		0.47	100.00 %
N Computer systems design etc.	5415	0.11	1.08 %				

Notes: α_z denotes the capital share of industry z. The capital share is calculated as 1 minus the average employee compensation over value added during 1989-2008. The data are not adjusted for the income of the self-employed. P_zY_z/PY denotes the average output share 1989-2008. The data are drawn from the BEA NIPA Tables.

Figure 3: Saving, investment, current account and RCA (Main Result)



Notes: The figure shows the responses of Home and Foreign after a persistent 3% increase in Foreign's labor productivity growth rate. The parameter choices are as follows: the capital intensities are $\alpha_A \in 0.65$, $\alpha_B \in 0.29$ and $\alpha_N \in 0.47$; the share of the capital intensive good within the tradable sector is set to $\gamma_{AB} = 0.5$; the share of tradables in GDP is $\gamma_{NT} = 0.2$; there is home bias, i.e. $\gamma_{HF} = 0.7$. the elasticity of substitution across tradable industries is set to $\theta_{AB} = 0.5$; the elasticity of substitution across tradable and non-tradable goods is set to $\theta_{NT} = 0.5$; the elasticity of substitution across Home and Foreign goods is set to $\theta_{HF} \in \{1.75, 500\}$, $\theta_{HF} = 500$ is a proxy for an infinite elasticity; the discount factor is $\beta = 0.97$; the depreciation rate $\delta = 0.09$; the intertemporal elasticity of substitution is set to $1/\phi = 0.5$; the shock persistence is $\rho = 0.9$; there are no capital market frictions, i.e. $\psi_K = 2$.

The panels show the impulse responses of saving, investment, the current account and RCA. In the first row, all four variables show a response. Saving rates in Foreign drop as consumers start borrowing against their expected higher future income (Panel A.1). Investment rates in Foreign increase to bring down returns to capital (Panel A.2). The current account of Foreign is in persistent deficit reflecting the increase in investment and the decrease in saving (Panel A.3). Each country's revealed comparative advantage changes, which reflects the gains from inter-industry trade (Panel A.4). However, these impulse responses are inconsistent with the data in two ways. First, the simulations imply that a strong relation between RCA and each of growth, investment and saving across countries is present. Second, the simulations imply that saving and investment rates are negatively correlated across countries. As discussed in Section 2, the cross-country data rather indicate that the relation between RCA and the aforementioned macro variables is weak at best, while saving and investment rates are strongly positively correlated.[21]

[21]There is a large literature concerned with explaining this latter finding first documented by Feldstein and Horioka (1980).

Under intra-industry trade the simulation responses change in two crucial ways. In the second row, we see that the response of RCA is virtually flat (see Panel B.4), i.e. there is no response. We also see that saving rates in Foreign are higher than in Home (see Panel B.1). Thus, the presence of intra-industry trade can assist in explaining the two key features of the data.

Why does augmenting the model with intra-industry trade suppress the inter-industry dynamics? The presence of intra-industry dynamics attenuates the importance of inter-industry dynamics because goods within industries are imperfect substitutes. By contrast, when goods are perfect substitutes across countries, the location of production does not play a key role in the standard theory.[22] In this case, an optimal global production allocation implies that countries specialize in the production of goods in which they have a comparative advantage. This comparative advantage changes in the presence of growth differentials between countries. This is why in theory, under growth differentials, the production location of capital- and labor-intensive tasks moves between countries. When goods produced in different countries, however, are imperfect substitutes, moving the production location to exploit gains from specialization results in a loss of varieties. This loss in varieties is neither desirable for the consumer who has a preference for varieties nor for investors who use these varieties in investment.

Why does augmenting the model with intra-industry trade increase saving in Foreign? In the standard neoclassical model, the response to growth shocks is an investment rate increase and a saving rate decrease in the fast growing country. Hence, the faster growing country's external balance exhibits a large deficit. Conversely, the model featuring intra-industry trade is consistent with the positive empirical correlation between saving and investment. Specifically, the developments in the intra-industry model of Section 3 can be outlined as follows. As in the standard model, investment rates are relatively high in faster growing countries. However, this increase in investment is not as large as in the typical case given that investment is partially non-tradable. Meanwhile, unlike in the standard model, corresponding saving rates are also relatively high. The difference on the saving side occurs for two reasons. First, since a large part of the economy is non-tradable with complementarity between tradable and non-tradable goods, and home and foreign tradables are imperfect substitutes, higher investment to a large degree needs to be provided in domestic goods. Second, consumers do not excessively import consumption from abroad without having domestic goods that can complement the imported consumption goods. As a result, higher domestic investment is accompanied by higher domestic saving.

4.3 Discussion

Is there intra-industry trade between developed and developing countries? As Table 8 shows, both developed and developing countries import and export both capital and labor intensive goods from and to each other. Importantly, the proportions of these goods in total developed-developing trade are very similar across these two country groups. While 24% of developing countries imports from developed countries

[22] Put differently, production location does not matter for the overall number of distinct goods available.

are capital intensive in 1995, 21% of developed countries imports from developing countries are capital intensive. In turn, 76% of developing countries imports from developed countries are labor intensive, 79% of developed countries imports from developing countries are labor intensive. The table also shows that these shares do not vary significantly over time. In 2005, 26% of developing countries imports from developed countries are capital intensive in 1995, 22% of developed countries imports from developing countries are capital intensive. In turn, 74% of developing countries imports from developed countries are labor intensive, 78% of developed countries imports from developing countries are labor intensive. The bottom line is that these shares provide strong empirical support for our assumption that there is intra-industry trade in capital and labor intensive industries between developed and developing countries.

Table 8: Capital and Labor Intensive Import and Export Shares

		Imports		**Exports**	
		developing from developed	developed from developing	developed to developing	developing to developed
1995	capital intensive	0.24	0.21	0.24	0.21
	labor intensive	0.76	0.79	0.76	0.79
2005	capital intensive	0.26	0.22	0.26	0.22
	labor intensive	0.74	0.78	0.74	0.78

Notes: This table shows the shares of imports and exports in total developing-developed trade in 1995 and 2005. Appendix A lists the two country groups. Table 7 provides the definition into capital and labor intensive goods. The data are based on the CEPII BACI World Trade data.

5 Conclusion

In this paper, we construct two macro-trade datasets, one based on U.S. trade data and the other on world trade data, to demonstrate empirically that indicators of factor proportions based trade only weakly correlate with key macroeconomic variables across countries. This finding contrasts with the predictions of standard models which imply that growth differentials between countries should lead to pronounced trade specialization patterns and changes in aggregate economic outcomes. We show that introducing intra-industry trade into an otherwise standard theory can reconcile the model behavior with the empirical evidence along several dimensions.

Our explanation is simple: foreign and domestic tradable goods are imperfect substitutes. Therefore, strong inter-industry dynamics are undesirable as they result in a loss of domestic varieties. Accordingly, intra-industry trade acts to suppress inter-industry trade dynamics. Furthermore, due to the limited substitutability between domestic and foreign varieties, saving and investment rates are positively correlated across countries. Consumers in faster-growing countries do not want to excessively import consumption from abroad without having domestic varieties to complement the foreign varieties. Meanwhile, higher domestic investment to a large extent needs to be provided in domestic goods.

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Appendices

A Country Sample

Developed: Australia (AUS), Austria (AUT), Belgium (BEL), Canada (CAN), Denmark (DNK), Finland (FIN), France (FRA), Germany (DEU), Greece (GRC), Iceland (ISL), Ireland (IRL), Italy (ITA), Japan (JPN), Luxembourg (LUX), Netherlands (NLD), New Zealand (NZL), Norway (NOR), Portugal (PRT), Spain (ESP), Sweden (SWE), Switzerland (CHE), United Kingdom (GBR), United States (USA).

Developing: Argentina (ARG), Bangladesh (BGD), Belarus (BLR), Brazil (BRA), Bulgaria (BGR), Cameroon (CMR), Chile (CHL), China (Mainland) (CHN), Colombia (COL), Costa Rica (CRI), Croatia (HRV), Cuba (CUB), Cyprus (CYP), Czech Republic (CZE), Dominican Republic (DOM), Egypt, Arab Rep. (EGY), El Salvador (SLV), Estonia (EST), Ghana (GHA), Guatemala (GTM), Hong Kong S.A.R. (HKG), Hungary (HUN), India (IND), Indonesia (IDN), Israel (ISR), Kenya (KEN), Korea Rep. (KOR), Latvia (LVA), Lebanon (LBN), Lithuania (LTU), Malaysia (MYS), Mexico (MEX), Morocco (MAR), Pakistan (PAK), Peru (PER), Philippines (PHL), Poland (POL), Puerto Rico (PRI), Romania (ROM), Russia (RUS), Serbia (SRB), Singapore (SGP), Slovak Republic (SVK), Slovenia (SVN), South Africa (ZAF), Sri Lanka (LKA), Sudan (SDN), Thailand (THA), Tunisia (TUN), Turkey (TUR), Ukraine (UKR), Uruguay (URY), Vietnam (VNM).

B Summary Statistics

Summary Statistics: 1995-2006 averages

	BACI World Trade			**U.S. NAICS Trade**						
country	$\overline{RCA_1}$	$\overline{RCA_2}$	$\overline{RCA_3}$	$\overline{RCA_1}$	$\overline{RCA_2}$	$\overline{RCA_3}$	$\overline{\left(\frac{S}{Y}\right)}$	$\overline{\left(\frac{I}{Y}\right)}$	$\overline{\left(\frac{CA}{Y}\right)}$	$\overline{g}$
ARG	5.20	0.76	0.44	5.40	0.73	0.51	17.18	17.41	0.10	1.49
AUS	4.95	0.70	0.28	4.86	0.67	0.30	21.21	25.79	−4.60	2.44
AUT	4.73	0.68	0.25	4.85	0.68	0.27	25.35	25.26	−0.15	2.19
BEL	4.93	0.72	0.31	5.04	0.70	0.38	26.64	22.52	3.03	1.92
BGD	3.47	0.64	0.09	3.54	0.66	0.08	27.01	22.59	−0.42	3.55
BGR	4.79	0.70	0.28	4.83	0.71	0.35	16.65	19.07	−4.60	4.03
BLR	4.83	0.69	0.30	5.44	0.75	0.66	22.76	25.93	−3.28	6.20
BRA	4.96	0.71	0.31	5.02	0.66	0.29	14.98	17.02	−1.76	1.31
CAN	4.98	0.71	0.30	5.16	0.70	0.34	21.95	20.93	0.92	2.29
CHE	4.83	0.70	0.27	4.88	0.69	0.26	34.11	24.56	10.70	1.19
CHL	5.80	0.77	0.41	5.55	0.74	0.41	21.84	23.54	−0.98	3.47
CHN	4.34	0.67	0.19	4.26	0.64	0.16	42.41	39.41	3.00	8.76
CMR	4.63	0.66	0.28	6.31	0.81	0.96	15.05	16.81	−2.76	1.68
COL	4.86	0.72	0.30	5.20	0.75	0.49	15.19	19.20	−2.15	1.33
CRI	4.73	0.74	0.28	4.28	0.71	0.20	15.41	20.35	−4.07	2.61
CUB	5.49	0.71	0.32					11.32		4.90
CYP	4.86	0.74	0.25	4.56	0.72	0.31	16.10	19.24	−3.57	2.17
CZE	4.68	0.68	0.24	4.69	0.64	0.22	27.85	31.06	−4.04	3.64

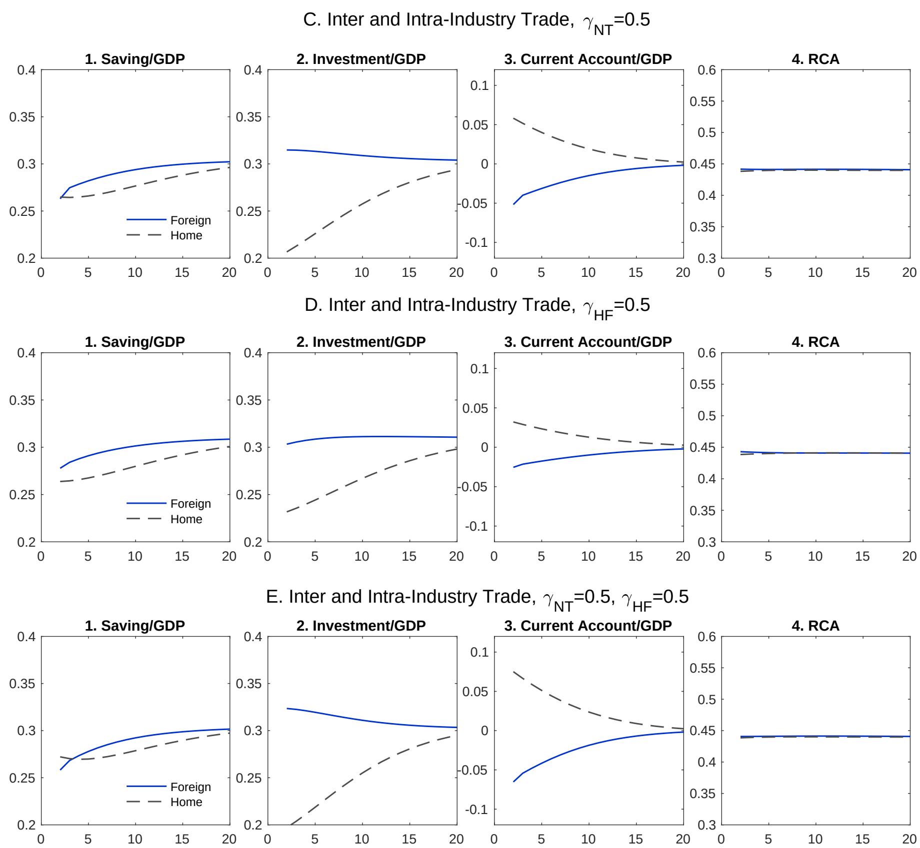
DEU	4.85	0.70	0.28	5.09	0.70	0.30	22.63	21.59	1.16	1.38
DNK	4.56	0.70	0.25	4.74	0.69	0.27	25.24	21.80	1.94	1.88
DOM	3.89	0.69	0.14	3.88	0.70	0.11	17.48	19.23	−1.03	4.06
EGY	4.64	0.69	0.26	4.59	0.72	0.34	19.77	18.78	0.60	2.75
ESP	4.82	0.71	0.28	4.97	0.68	0.34	23.12	26.18	−3.44	2.65
EST	4.49	0.68	0.23	6.09	0.78	0.83	23.42	31.71	−8.89	7.91
FIN	5.05	0.70	0.28	5.34	0.70	0.38	28.42	22.57	5.97	3.50
FRA	4.83	0.71	0.28	4.93	0.70	0.29	23.06	21.27	1.25	1.58
GBR	4.89	0.72	0.28	5.08	0.71	0.33	17.47	19.08	−1.74	2.74
GHA	4.62	0.65	0.21	5.25	0.71	0.67	17.37	23.53	−5.85	2.26
GRC	4.67	0.71	0.28	5.29	0.74	0.47	18.18	24.58	−6.16	3.29
GTM	4.41	0.71	0.23	3.75	0.70	0.11	13.15	17.99	−4.88	1.32
HKG	4.46	0.68	0.24	4.02	0.68	0.18	31.87	26.55	7.49	2.61
HRV	4.42	0.66	0.24	4.96	0.72	0.39	19.24	23.90	−5.75	4.53
HUN	4.77	0.70	0.26	5.11	0.70	0.33	20.07	26.16	−6.68	3.65
IDN	4.63	0.68	0.26	4.29	0.66	0.19	24.32	24.07	1.66	2.19
IND	4.34	0.66	0.23	4.08	0.64	0.17	27.73	27.20	−0.50	4.98
IRL	5.22	0.78	0.41	5.45	0.77	0.50	25.95	24.62	−0.03	5.74
ISL	5.02	0.69	0.22	4.69	0.65	0.19	16.80	23.96	−6.96	3.09
ISR	4.41	0.66	0.23	4.16	0.63	0.18	18.80	21.62	−0.82	1.72
ITA	4.48	0.67	0.22	4.49	0.66	0.23	21.19	20.47	0.22	1.33
JPN	4.95	0.70	0.29	5.07	0.69	0.31	27.54	24.80	2.77	0.97
KEN	4.54	0.73	0.28	3.99	0.71	0.16	16.69	17.10	−7.05	0.63
KOR	4.99	0.70	0.32	5.04	0.71	0.38	33.14	31.49	2.24	4.23
LBN	4.37	0.67	0.25	3.93	0.67	0.20	-0.24	24.89	−17.41	1.11
LKA	3.69	0.65	0.12	3.69	0.67	0.09	21.71	24.89	−3.26	3.95
LTU	4.54	0.68	0.26	5.53	0.76	0.70	14.19	22.14	−8.04	6.71
LUX				5.25	0.66	0.26	22.32	20.38	10.17	3.21
LVA	4.45	0.66	0.24	6.50	0.81	0.93	17.23	25.96	−8.74	7.58
MAR	4.43	0.70	0.29	5.12	0.77	0.51	27.19	26.11	0.91	2.52
MEX	4.71	0.70	0.24	4.73	0.68	0.24	20.22	21.06	−1.77	1.48
MYS	5.12	0.73	0.38	5.00	0.71	0.37	36.05	28.68	7.28	2.97
NLD	5.05	0.74	0.35	5.42	0.74	0.48	28.25	22.06	5.12	2.26
NOR	5.01	0.68	0.28	5.64	0.73	0.53	31.74	21.46	10.32	2.39
NZL	4.71	0.71	0.29	4.65	0.67	0.26	18.43	22.30	−5.17	1.98
PAK	4.02	0.63	0.16	3.81	0.65	0.12	22.35	17.61	−1.47	2.12
PER	5.26	0.72	0.32	5.37	0.73	0.39	16.43	19.17	−2.79	2.67
PHL	5.07	0.73	0.41	4.87	0.72	0.40	37.90	21.89	−0.92	2.07
POL	4.56	0.68	0.24	4.79	0.67	0.24	19.55	21.35	−3.54	4.73
PRI								16.91		2.71
PRT	4.48	0.69	0.24	4.66	0.68	0.37	18.94	25.83	−7.51	2.11
ROM	4.33	0.66	0.20				15.63	21.96	−6.20	3.59
RUS	5.34	0.70	0.32	5.94	0.73	0.53	28.48	20.38	7.80	3.98
SDN	5.03	0.67	0.32				14.25	22.17	−6.70	4.07
SGP	5.25	0.74	0.40	5.12	0.70	0.38	46.10	28.66	17.28	3.59
SLV	4.22	0.68	0.20	3.78	0.69	0.11	14.07	16.70	−2.63	2.51
SRB								18.84		4.47
SVK	4.86	0.69	0.27	5.10	0.67	0.28	24.35	30.34	−4.66	4.58
SVN	4.56	0.68	0.23	4.62	0.67	0.25	25.97	27.11	−1.09	4.03
SWE	4.91	0.70	0.27	5.13	0.72	0.32	27.21	21.64	4.82	2.99
THA	4.75	0.70	0.29	4.52	0.67	0.24	30.46	28.40	1.85	2.49
TUN	4.12	0.68	0.20	5.50	0.75	0.68	21.40	24.29	−2.69	3.62

TUR	4.36	0.67	0.21	4.32	0.68	0.21	18.43	20.74	−1.89	3.38
UKR	5.31	0.70	0.29	5.78	0.72	0.37	24.00	21.76	2.35	2.93
URY	4.55	0.69	0.26	4.45	0.64	0.24	14.27	15.97	−1.00	1.30
USA	4.87	0.70	0.29				19.40	22.85	−3.74	2.17
VNM	3.89	0.66	0.15	3.94	0.64	0.11	27.26	30.08	−1.65	6.07
ZAF	5.01	0.68	0.29	5.42	0.68	0.33	16.32	17.70	−1.53	1.61

Notes: $\overline{x}$ denotes the mean of variable x. The real GDP per capita growth rate (g) and ratios of savings to GDP (S/Y), investment to GDP (I/Y), and current account to GDP (CA/GDP) are given in percentage terms.

C Robustness of Simulations

In this Appendix we show the robustness of the simulation results of Section 4.2. In particular, we test how the previously obtained results change under i) a different output composition ii) different elasticities across tradable industries and between domestic and foreign goods and iii) different assumptions about parameters that are of secondary order importance.



Notes: The figure shows the responses of Home and Foreign after a persistent 3% increase in Foreign's labor productivity growth rate. The parameter choices are as follows: the capital intensities are $\alpha_A = 0.65$, $\alpha_B = 0.29$ and $\alpha_N = 0.47$; the share of the capital intensive good within the tradable sector is set to $\gamma_{AB} = 0.5$; the share of tradables in GDP is $\gamma_{NT} \in \{0.2, 0.5\}$; there is home bias, i.e. $\gamma_{HF} \in \{0.7, 0.5\}$. the elasticity of substitution across tradable industries is set to $\theta_{AB} = 0.5$; the elasticity of substitution across tradable and non-tradable goods is set to $\theta_{NT} = 0.5$; the elasticity of substitution across Home and Foreign goods is set to $\theta_{HF} = 1.75$; the discount factor is $\beta = 0.97$; the depreciation rate $\delta = 0.09$; the intertemporal elasticity of substitution is set to $1/\phi = 0.5$; the shock persistence is $\rho = 0.9$; there are no capital market frictions, i.e. $\psi_K = 2$.

Figure I: Saving, investment, current account and RCA (robustness 1)

Figure I plots the results under different assumptions about the shares of sectors in GDP. The concern that drives us to run this robustness test here is twofold. First, the U.S., which we use to configure the model, does not necessarily have a representative output composition as its foreign trade activities are rather small by international standards. Second, since the industry structure of the economy is generally driving all of our results, changing the industry structure is an important robustness test.

In the first row, we test the robustness of our results towards increasing the share of tradables from $\gamma_{NT} = 0.2$ to $\gamma_{NT} = 0.5$. A higher tradable share has been employed by Stockman and Tesar (1995), among others. The increase has no effect on our main result. The response of RCA remains flat (see Panel C.4). The gap in investment rates across countries widens initially (see Panel C.2). Yet, saving and investment rates are still positively correlated (see Panels C.1 and C.2).

In the second row, we test the robustness of our results towards lowering the degree of home bias from $\gamma_{HF} = 0.7$ to $\gamma_{HF} = 0.5$. This increase has again no effect on our main result. The response of RCA remains flat (see Panel D.4). The gap in investment rates across countries is similar to our benchmark (see Panel B.2. and D.2). Thus, saving and investment rates are still positively correlated (see Panels D.1 and D.2).

In the third row, we test the robustness of our results towards simultaneously lowering the degree of home bias and increasing the share of tradables. This change has once again no effect on our main result. The response of RCA remains flat (see Panel E.4). The gap in investment rates across countries widens initially (see E.2). Saving and investment rates remain positively correlated (see Panels E.1 and E.2).

Figure II plots the results under different assumptions about the elasticities between tradable goods. Altering these elasticities is important as they are the second set of key parameters that govern the industry structure of the economies. We conduct this test to highlight the strength of our results which are crucially affected by the choice of these elasticities.

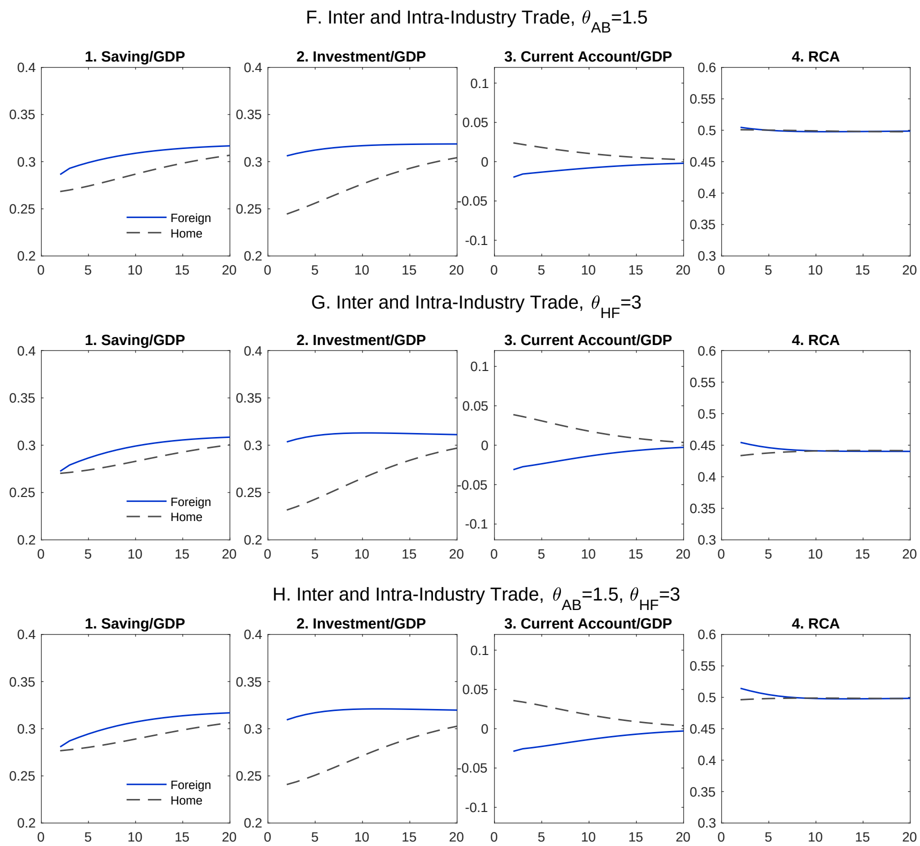
In the first row, we test the robustness of our results towards increasing the elasticity between capital and labor intensive tradable goods from $\theta_{AB} = 0.5$ to $\theta_{AB} = 1.5$. Although it is plausible to assume that these goods are rather complements, it is important to relax this assumption to get a feeling for the robustness of the results. As the Figure shows, the increase in elasticity has no effect on our results. The response of RCA remains flat for the most part (see Panel G.4). Only at the very beginning do we observe a quantitatively tiny response. Saving and investment responses are very similar to our benchmark responses (compare Panels F.1 and F.2 with B.1. and B.2).

In the second row, we test the robustness of our results towards increasing the elasticity between Home and Foreign varieties from $\theta_{HF} = 1.75$ to $\theta_{HF} = 3$. This test is important to show that our key result also holds under relaxed assumptions. The response of RCA remains mostly flat (see Panel F.4). Only at the beginning do we observe some quantitatively small response. This response could be flattened out by the presence of a moderate degree of labor adjustment costs. Saving responses of Home and Foreign move a bit closer together relative to the benchmark (compare Panels G.1 with B.1). Investment responses behave similar to our benchmark (compare Panels G.2 with B.2). Thus, saving and investment rates are still positively correlated across countries.

In the third row, we test the robustness of our results towards simultaneously increasing both the elasticity between Home and Foreign varieties as well as the elasticity between capital and labor intensive tradable goods. This change has once again no effect on our main result. The response of RCA remains largely suppressed (see Panel H.4). Saving responses of Home and Foreign move a bit closer together relative to the benchmark (compare Panels H.1 with B.1). Investment responses are similar to the ones in the benchmark. Thus, saving and investment rates remain positively correlated.

Figure III plots the results under different assumptions about other variables that are of second order importance. Again, we conduct these tests to highlight the robustness of our results.

In the first row, we test the robustness of our results towards increasing the persistence of the productivity shock in Foreign from $\rho = 0.9$ to $\rho = 0.95$. Our main result remains unaffected. The response of RCA is flat (see Panel I.4). Furthermore, the higher growth persistence does not change the responses of saving and investment rates qualitatively (see Panel I.1 and I.2). Both rates stay positively correlated across countries.

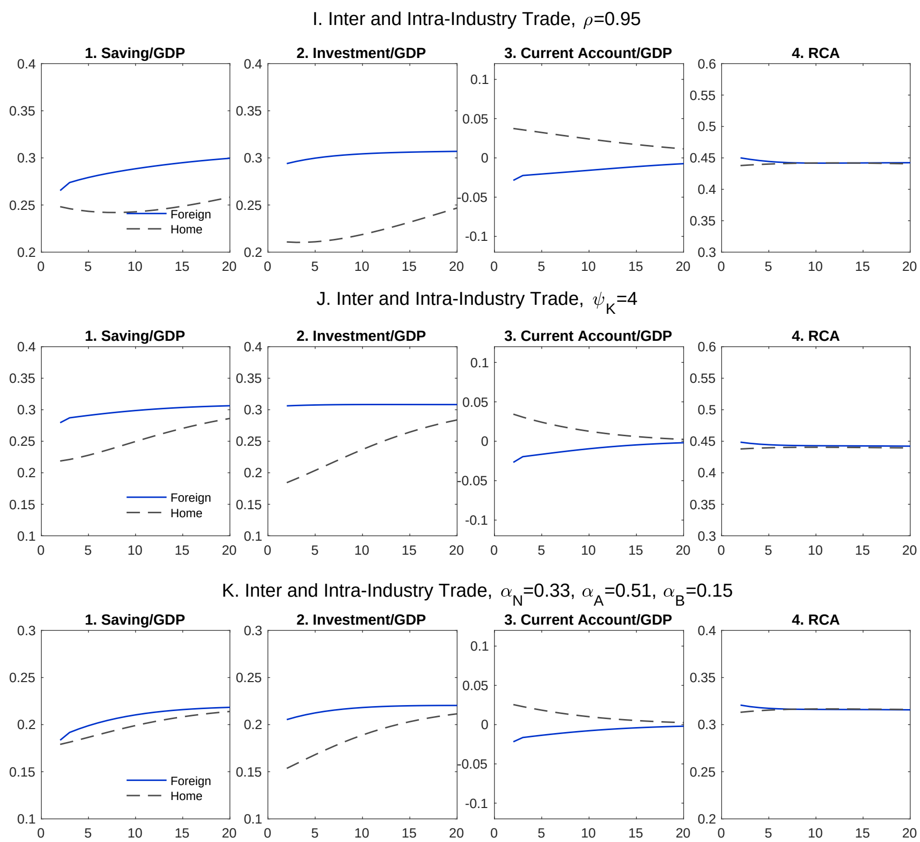


Notes: The figure shows the responses of Home and Foreign after a persistent 3% increase in Foreign's labor productivity growth rate. The parameter choices are as follows: the capital intensities are $\alpha_A = 0.65$, $\alpha_B = 0.29$ and $\alpha_N = 0.47$; the share of the capital intensive good within the tradable sector is set to $\gamma_{AB} = 0.5$; the share of tradables in GDP is $\gamma_{NT} = 0.2$; there is home bias, i.e. $\gamma_{HF} = 0.7$. the elasticity of substitution across tradable industries is set to $\theta_{AB} \in \{0.5, 1.5\}$; the elasticity of substitution across tradable and non-tradable goods is set to $\theta_{NT} \in 0.5$; the elasticity of substitution across Home and Foreign goods is set to $\theta_{HF} \in \{1.75, 3\}$; the discount factor is $\beta = 0.97$; the depreciation rate $\delta = 0.09$; the intertemporal elasticity of substitution is set to $1/\phi = 0.5$; the shock persistence is $\rho = 0.9$; there are no capital market frictions, i.e. $\psi_K = 2$.

Figure II: Saving, investment, current account and RCA (robustness 2)

In the second row, we test the robustness of our results towards increasing the amount of capital adjustment costs from $\psi_K = 2$ to $\psi_K = 4$. Higher capital adjustment costs are for example employed by Aguiar and Gopinath (2007). Under higher adjustment costs, the response of RCA remains flat (see Panel J.4). Saving and investment responses remain similar to our benchmark (compare Panels J.1 with B.1 and J.2 with B.2).

Finally, in the third row, we test the robustness of our results towards an overall higher labor share. We reduce the capital share of all three sectors by 14 percentage points. This change has once again no effect on our main result. The response of RCA remains flat (see Panel K.4). Saving responses of Home and Foreign move a bit closer together relative to the benchmark (compare Panel K.1 with B.1). Investment responses are similar to the ones in the benchmark. Saving and investment rates are generally at a lower level but remain positively correlated.



Notes: The figure shows the responses of Home and Foreign after a persistent 3% increase in Foreign's labor productivity growth rate. The parameter choices are as follows: the capital intensities are $\alpha_A \in \{0.65, 0.51\}$, $\alpha_B \in \{0.29, 0.15\}$ and $\alpha_N \in \{0.33, 0.47\}$; the share of the capital intensive good within the tradable sector is set to $\gamma_{AB} = 0.5$; the share of tradables in GDP is $\gamma_{NT} = 0.2$; there is home bias, i.e. $\gamma_{HF} = 0.7$. the elasticity of substitution across tradable industries is set to $\theta_{AB} = 0.5$; the elasticity of substitution across tradable and non-tradable goods is set to $\theta_{NT} = 0.5$; the elasticity of substitution across Home and Foreign goods is set to $\theta_{HF} = 1.75$; the discount factor is $\beta = 0.97$; the depreciation rate $\delta = 0.09$; the intertemporal elasticity of substitution is set to $1/\phi = 0.5$; the shock persistence is $\rho \in \{0.9, 0.95\}$; there are no capital market frictions, i.e. $\psi_K \in \{2, 4\}$.

Figure III: Saving, investment, current account and RCA (robustness 3)

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