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LOCAL FOOD PRICES AND INTERNATIONAL PRICE TRANSMISSION

Abstract

World food prices spiked in the periods 2007-2008 and 2010-2011. The impact of these spikes in world food prices on local food prices and thus on local consumers is determined by the food price pass through. Pass through is defined as the extent to which changes in world food prices lead to changes in local food prices. We examine the determinants of variation in food price pass through from global to local consumer prices in a global sample of 147 countries, using FAO data on world food prices and ILO data on food prices for consumers. While market integration matters, our study finds that income per capita is the dominant factor explaining cross-country variation in pass through of food prices. We estimate an elasticity of about -0.3 of pass through with respect to income per capita. This means far greater price transmission of food price shocks at the commodity level to final consumers in low income countries than in high income countries. The implication is that future swings in world food prices will in particular jeopardise food security in poor countries. Trade policy measures of market integration also affect the pass through significantly, whereas infrastructure and geography measures play no significant role.

JEL Classification: Q02, Q11, Q17, Q18

Keywords: Food Price Pass Through, Local Food Prices, Primary Food Shares

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Local Food Prices and International Price Transmission

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ABSTRACT: World food prices spiked in the periods 2007-2008 and 2010-2011. The impact of these spikes in world food prices on local food prices and thus on local consumers is determined by the food price pass through. pass through is defined as the extent to which changes in world food prices lead to changes in local food prices. We examine the determinants of variation in food price pass through from global to local consumer prices in a global sample of 147 countries, using FAO data on world food prices and ILO data on food prices for consumers. While market integration matters, our study finds that income per capita is the dominant factor explaining cross-country variation in pass through of food prices. We estimate an elasticity of about -0.3 of pass through with respect to income per capita. This means far greater price transmission of food price shocks at the commodity level to final consumers in low income countries than in high income countries. The implication is that future swings in world food prices will in particular jeopardize food security in poor countries. Trade policy measures of market integration also affect the pass through significantly, whereas infrastructure and geography measures play no significant role.

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1 Introduction

World food prices spiked in the periods 2007-2008 and 2010-2011. Various reasons have been spelled out for these price spikes, ranging from extreme weather events to increased use of food stocks as biofuel input, rising energy prices, larger meat demand in emerging countries, exchange rate movements and low stock level expectations (see for example Abbott and de Battisti (2011), Diouf (2008) and Timmer (2008)).[1] Ray el al. (2015) attribute one-third of crop yield variations to climate variation, while Asseng et al. (2015) find that warming trends are driving down global wheat yields. On the socioeconomic front, Dessus et al. (2008), Ivanic and Martin (2008), and Ivanic et al. (2012) conclude that recent episodes of spikes in food prices raised poverty considerably, especially in urban areas of food importing countries. Soaring prices can also contribute to political unrest, and the most recent episodes generated protectionist measures in many countries. Anderson et al. (2014) have pointed out that these policy measures actually magnified price shocks, while Swinnen and Squicciarini (2012) have argued that calls for protectionist measures by NGOs are inconsistent with their earlier calls for abolition of food production subsidies in rich countries to help farmers in poor countries. There were consistent demands for changes in food policy in the Organisation for Economic Cooperation and Development (OECD) Member countries over the last two decades. In particular a mandate was negotiated for elimination of subsidies and income support to farmers. Changes in these policies led predictably to food price increases. These increases have themselves been criticised by the same combination of NGOs and developing countries thereafter. In addition, India is now invoking food security to justify departure from WTO obligations and introduction of the same support schemes developing countries lobbied heavily against when the WTO was established. See Swinnen and Squicciarini (2012) for further discussion.

The transmission of global food price shocks to high and low income consumers alike is linked closely to the food security debate, weaving patterns of price transmission together with poverty, politics, and trade policy. A large transmission of global food price shocks jeopardises food security for poor consumers in case of soaring world food prices.[2] The impact of an increase in world food prices on the local cost of living (and hence on local household consumption and the general affordability of food) is determined

by the food price pass through, the extent to which changes in world food prices lead to changes in local food prices. The standard explanation for variations in food price pass through relies on variations in the degree of market integration. The degree of market integration is a function of the size of trade costs, often heavily affected by government policy. Baffes and Gardner (2003) study how policy reform affected pass through, rejecting the hypothesis that pass through increased as a result of liberalisation. Myers and Jayne (2012) show that price transmission of South African maize prices to Zambian prices varies with the amount of imports, whereas Ferrucci et al. (2012) emphasise the importance of the Common Agricultural Policy (CAP) for pass through in the EU. Figure 1 suggests that something more fundamental is also at play: the level of income. Local consumer prices for food in a rich country like Sweden are far less responsive to world food prices than local consumer prices for food in poor countries like Gabon and China.[3]

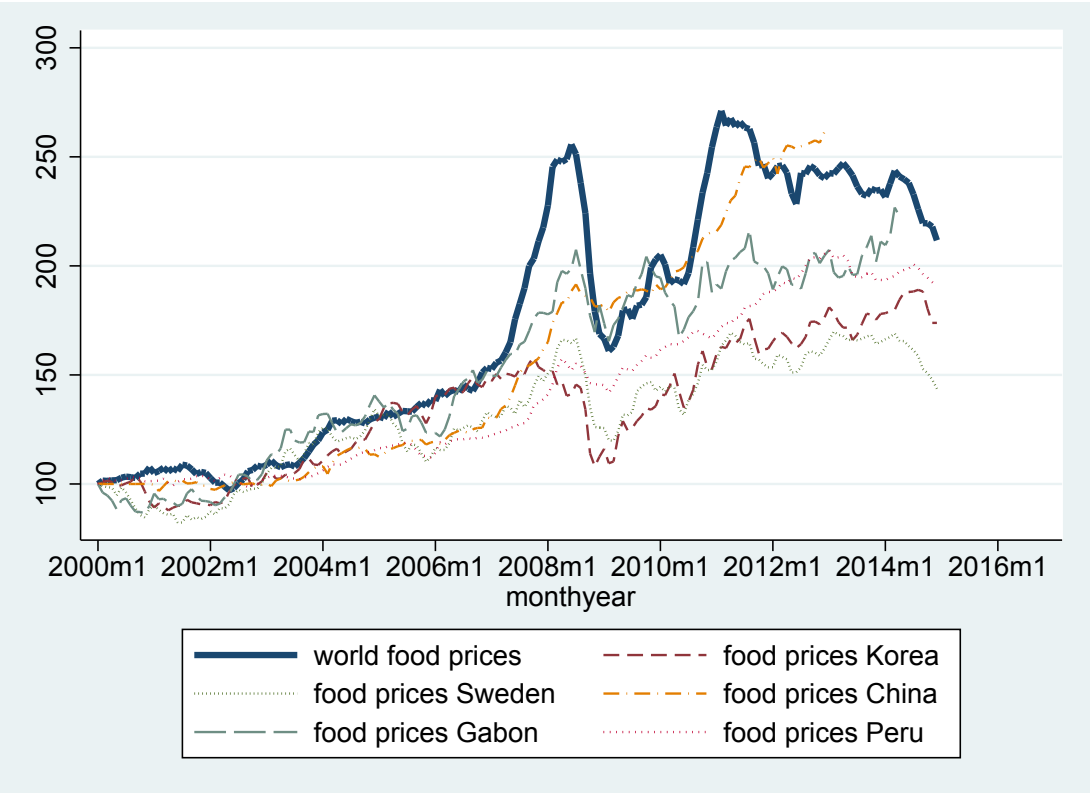

Figure 1: The world food price and local dollar food price indexes, selected countries

In this paper we examine the determinants of world food price pass through, employing a worldwide

sample of monthly local food price indices from 147 countries. We proceed in two steps. In the first step we estimate the pass through on a country by country basis with regressions of local food price indices on a world food price index. The monthly local food price indices are collected by the ILO while the monthly world food price index is from the FAO. For the first step we follow two alternative approaches. First, following the recent exchange rates pass through literature (Campa and Goldberg, 2005; Nakamura and Zerom, 2012), we regress the first difference of the local food price index on a series of lags of the first difference of the world food price index, defining the long run pass through as the sum of the coefficients on all the lags.[4] As in Nakamura and Zerom (2012) the number of lags is determined by the rule that the long run pass through does not change anymore upon adding more lags, leading to the inclusion of 15 lags. Second, we also estimate a more parsimonious model including lagged dependent variables of the local food price index. The number of lags is determined based on the minimum Bayesian information criterion (BIC). In these estimations the number of lags is country-dependent with an average of about 1.4. In the second step we relate the estimated long run pass through rates to income levels and various indicators of market integration. To do so, we regress the pass through coefficients estimated in the first stage on GDP per capita and different measures of market integration. The two approaches to estimate the long run pass through in the first step lead to largely the same results on its determinants.

We find that a key indicator for cross-country variation in the long run primary food price pass through to consumers is the level of income. The elasticity of the pass through with respect to income per capita is about -0.3 and income per capita is very robust to variations in estimation methods and inclusion of different control variables. Richer countries have a lower pass through of the world food price to the local food price index, because their cost share of primary food in consumed food is lower.[5] This reflects two forces. First, rich countries demand higher quality food with larger expenditures on additional retail services and less reliance on cheap, low quality staples, which are highly tradable. Second, the price of the additional services in consumed food rises as countries grow richer due to Harrod-Balassa-Samuelson effects. Critically, this means that when we have observed spikes in global food commodity prices, as observed in the past and as expected with the continued impact of climate change, we can expect far larger food price increases for consumers in low income countries than for consumers in high income

countries, which in turn means greater pressure for regional demand adjustment to global price shocks in low income countries. Essentially, the burden of the food price increases falls on the poor. Examining the share of margin services in countries with different income levels in multi-country general equilibrium models like GTAP (Hertel, 1997) supports this interpretation with the share of margin services rising in the level of income.[6]

On the role of market integration we obtain three broad results. First, larger policy related trade costs like the costs to import a 20 foot container and the Trade Restrictiveness Index (TRI) measuring specific import protection in agriculture (Kee, et al., 2009) significantly reduce the food price pass through. Second, geography and infrastructure related trade costs do not affect the food price pass through. And third, we find a significantly higher food price pass through in countries with a larger Import Dependency Ratio (IDR).

We also find that the pass through is significantly lower in African countries relative to the rest of the world (more than 10% controlling for income per capita). The "African effect" is partially explained by higher policy related trade costs like the costs to import and export (serving to insulate local prices from movements but at the cost of substantially higher baseline price levels). There are no significant differences between other continents and the rest of the world.

We are not the first to examine local transmission of global food price increases. Several scholars have studied food price pass through in the aftermath of recent episodes of soaring food prices, but the focus has generally been on single countries or a small set of countries (IMF, 2008, 2011; Dawe, 2008; Cudjoe, et al., 2010; Minot, 2010; Rigobon, 2010; Gilbert, 2010; Ghoshray, 2011; Baltzer, 2013). By focusing on food price indices instead of individual sets of commodity prices, we are able to explore variations in pass through across a large set of almost 150 countries.[7] Our main contribution to the existing literature is calculating and formally examining the determinants of food price pass through for a large, global sample of countries. Because we work with a global sample, we are able to evaluate the contribution of income per capita and various forms of market integration measures in explaining variations in food price pass through rates.

2 Food Price pass through in Theory

The consumption of a bundle of food products Q_f in a certain country can be decomposed into a bundle of primary food components Q_{pf} of food traded internationally like wheat, meat and milk and a bundle of additional services in food consumption Q_{sf} not traded internationally such as shipping, local processing, storage, and distribution. Suppose Q_f is a homothetic function of Q_{pf} and Q_{sf}.[8] We can then write the price index of food consumption P_f in our country as a function of the local price index of primary food P_{pf} and the local price index of food services P_{sf}:

$$P_f = G\left(P_{pf}, P_{sf}\right) \tag{1}$$

The local price index of primary food P_{pf} is related to the international price index of primary food P_{ipf} times the exchange rate E. E is the exchange rate of our country relative to the currency in which international food prices are denominated, i.e. the price of the international currency expressed in our local currency.[9] With perfect market integration P_{pf} and EP_{ipf} will be equal, but due to both natural barriers to trade like transport costs and policy measures like import tariffs or local food subsidies the two prices can differ.[10] We define ε_{mi} as the elasticity of P_{pf} with respect to EP_{ipf} indicating the degree of market integration. The degree of market integration depends, among others, on the size of import tariffs and transport costs and their potential adjustment in response to global price changes, as further studied in Section 4.

Log differentiating equation (1) and applying Shephard's lemma, the relative change of the price of food consumption can be expressed as a function of the relative change of the international price of primary food, the exchange rate and the price of food services:

$$\widehat{P_f} = s_{pf}\varepsilon_{mi}\left(\widehat{P_{ipf}} + \widehat{E}\right) + \left(1 - s_{pf}\right)\widehat{P_{sf}} \tag{2}$$

s_{pf} is the share of primary food in total food consumption, $s_{pf} = \frac{P_{pf}Q_{pf}}{P_f Q_f}$ and $1 - s_{pf}$ the share of local food services. The share of local food services tends to rise as countries grow richer for two reasons.

First, the Harrod-Balassa-Samuelson effect (Balassa, 1964; Baumol, 1967) tends to raise the price of local services as countries get richer. With limited possibilities for substitution between primary food and food services, this will increase the share of food services. Second, consumers' demand for quality will rise as countries grow and supply chains develop to provide higher, more consistent quality along with additional services as part of retail food expenditures. This raises the share of the local services component in total food consumed.[11] Since we expect the share of primary food in food consumption to fall with the level of income, we expect a smaller impact of world food prices on local food prices in richer countries. Therefore, we expect a negative sign for GDP per capita in the regressions explaining the pass through of world food prices to local food prices.

3 Methodology and Data

We turn equation (2) into an estimating equation using monthly data on log changes in local and international prices and exchange rates. To do so we take two alternative approaches. First, we follow a common practice in the literature on exchange rate pass through (Campa and Goldberg, 2005; Nakamura and Zerom, 2012) and regress the first difference of the log price of total food consumption on the first difference of the log price of internationally traded food:[12]

$$\Delta \log P_{f,jt} = \kappa + \sum_{k=0}^{K} \beta_{jk} \Delta \log P_{ipf,jt-k} + \sum_{k=0}^{K} \gamma_{jk} \Delta \log E_{jt-k} + \varepsilon_{it} \tag{3}$$

j is a country subscript and t is the month subscript. The sum of pass through coefficients, $\sum_{k=0}^{K} \beta_{j,k}$ generates the long run pass through of the world food price index to the local food price index in country j. The number of lags K is determined by the rule followed in Nakamura and Zerom (2012) that adding more lags does not change the long run elasticity. We implement this rule by calculating the average long run pass through across all countries in the sample and evaluating at which lag length this average stabilises. Based upon this rule we work with 15 lags. More specifically, the lag length at which the long run pass through stabilises is defined as the lag length where the relative difference in long run

pass through with the average of long run pass-throughs with 1 and 2 lags less is smaller than a certain threshold (5%). We do not vary the lag length by country in this first approach. Also Campa and Goldberg (2005) and Nakamura and Zerom (2012), respectively calculating pass-throughs for different countries and pass throughs for retail and wholesale coffee prices, choose one lag length for all their regressions.

Second, we implement a more parsimonious model by including lagged dependent variables of the first difference of the log price of total food consumption. We estimate the following model:

$$\Delta \log P_{f,jt} = \kappa + \sum_{l=1}^{L_j} \alpha_{jl} \Delta \log P_{f,jt-l} + \sum_{k=0}^{K_j} \beta_{jk} \Delta \log P_{ipf,jt-k} + \sum_{k=0}^{K_j} \gamma_{jk} \Delta \log E_{jt-k} + \varepsilon_{it} \tag{4}$$

The number of lags in equation (4) varies across countries and is determined based on the Bayesian information criterion (BIC). The average number of lags of the dependent variable L_j is 1.1 with one lag in more than 95% of the countries. The average number of lags of the independent variables, K_j, is 1.38 with one lag in more than 75% of the countries.

Several scholars estimate a vector error correction (VEC) model to determine the long run pass through (Baffes and Gardner, 2003; Conforti, 2004; Gilbert, 2010; Minot, 2010; Cudjoe, et al., 2010). In line with the cited literature on the determinants of exchange rate pass through, we do not follow this route for three reasons. First, world and local food prices do not co-move because of poor market integration (see Adam (2011) and Ianchovichina, et al. (2012) for further discussion). Second, there is an important local cost component in the food prices analysed, making it less likely that the world food price index and local food price indices are cointegrated. Third, Engle Granger tests of the existence of cointegration show that in only 4 of the 147 countries we can reject the hypothesis of no cointegration. In a robustness check we test for cointegration with the Johansen test and estimate a VEC model for the countries where a cointegration relationship exists according to the Johansen test. We discuss results of VEC models in section 5 on robustness checks.

The price of total food consumption in country j, $P_{f,jt}$, is measured with the food component in country j's CPI, measured in local prices, and the price index of internationally traded food, $P_{ipf,jt-k}$,

is measured with an international food price index in dollars, both measured on a monthly basis.[13] The exchange rate E_{jt-k} is defined as the price of dollars in local currencies. We allow for different pass through coefficients of the world food price β_{jk} and the exchange rate γ_{jk} since tests of equality of the world food price and exchange rate pass through reject the hypothesis that the two pass throughs are equal.[14] In the exposition below we concentrate on the long run pass-throughs of the world food price.[15]

To analyse the determinants of the long run food price pass through we proceed in two steps. In the first step, we estimate equation (3) country by country. In the second step, we regress the calculated long run pass-throughs on income levels and other determinants of pass through related to the degree of market integration. In the second step we use weighted least squares, with as weights the standard errors of the estimated long run pass-throughs, thus giving more weight to more precisely estimated pass-throughs.

Our price data consist of monthly data over the period 2000-2012. The price of internationally traded food, $P_{ipf,jt}$, is calculated from the world food price index (WFPI) composed by the FAO (FAO (2013)). This price index is based upon 55 items in five broad categories: cereals, oils and fats, dairy, meat and sugar. The price of total food consumption in country j in period t, $P_{f,jt}$, is calculated from the food component in country j's consumer price index (CPI) as composed by the ILO, ILO (2013). The ILO collects data on consumer food prices in a broad cross-section of countries as part of its effort to collect data on consumer prices to be able to track changes in real wages. The consumer price indices for food come from the national statistical agencies. They are part of the larger CPI national price surveys. So ultimately, our consumer pricer data for food come from the national statistical agencies responsible for domestic price data. The consumption bundles employed to calculate local food price indices differ across countries. Unfortunately the ILO-dataset does not provide information on these consumption bundles. However, our explanation of the importance of income levels for the food price pass through aligns with differences in the composition of the food price bundle, emphasizing differences in the share of primary food in the consumed food price bundle.[16]

As food prices in some countries display very clear seasonal patterns we have first de-seasoned the data employing the X-12-ARIMA Monthly Seasonal Adjustment Method (US Census Bureau (2011) based on

Shiskin et al. (1967)). Monthly exchange rates are from the IMF IFS and the World Bank. Income per capita levels in PPP terms are from the World Bank. We define three income groups: poor (less than $770 per capita GDP at year 2000 prices), middle ($770-$9300 per capita GDP) and rich(more than $9300 per capita GDP).

4 Estimation Results

4.1 Estimated Pass-throughs

Before analysing the determinants of the long run pass through we evaluate the estimated pass-throughs employing the two methodologies described in Section 3. Table 1 shows that the average estimated pass through and standard deviation are much larger with a fixed number of 15 lags than with a variable number of lags together with a lagged dependent variable. The latter methodology, however, also generates a larger number of negative pass-throughs, 33 compared to 7. Tables 7 and 8 display the estimated the estimated long run pass through of the 147 countries in our sample. In Table 7 based on a fixed lag length the estimated long run pass through is significantly larger than zero at the 5% level in two-thirds of the countries. In Table 8 this share falls to one-third. Instead of throwing away valuable information, we decided to keep the estimated long run pass-throughs for countries where the long run pass through is not significantly larger than 5%. By weighting observations by the inverse standard error of the long run pass through, imprecise observations have relatively little impact in the second stage estimations.

4.2 pass through and Income

We start our analysis of the determinants of the long run pass through in table 2, where we analyse the impact of GDP per capita and evaluate continent differences.[17] The first column of the table displays the results of a regression of estimated pass through rates on GDP per capita showing that its impact is highly significant – it well characterises the cross-country pattern of pass through. Estimation in logs (second column) generates an elasticity of the long run pass through with respect to GDP per capita of -0.28.[18] The difference in long run pass-throughs across countries with different levels of income reflects

Table 1: Summary statistics of estimated long-run pass through and explanatory variables of variation in pass-through

Variable	Obs	Mean	Std.Dev.	Min	Max
Estimated long-run pass-through (LRPT)					
LRPT single lag length	147	0.246	0.217	-0.675	1.536
LRPT variable lag length	147	0.0531	0.0866	-0.210	0.520
Lags lagged dependent	147	1.231	0.713	1	5
Lags independent	147	1.109	0.803	1	10
Explanatory variables					
GDP PC	147	6836	9804	124.8	46592
Port Infra	128	4.179	1.121	1.545	6.792
Import Cost	146	1512	969.3	412	6910
NRA	74	0.255	0.401	-0.278	1.877
TRI	87	0.133	0.0913	0	0.507
IDR	100	0.495	0.893	0.0177	7.396

the larger share of margin services in food consumption in the rich countries, the term s_{pf} in equation (2).

In the third column we explore a possible nonlinear relation and add GDP per capita squared. Both terms are significant, with the linear term negative and the quadratic term positive. This indicates an L-shaped relationship: income growth has a stronger impact on the pass through at lower levels of income.

In the fourth column we add the income group dummies. We include both income group dummies and income per capita to examine whether the effect of income on pass through reflects differences between broad groups of countries (rich, middle-income, and poor) or also differences within these broad groups of countries. With rich being the omitted category, we see that the difference in pass through between rich and middle income countries and between rich and poor countries is highly significant. GDP per capita is still significant at the 5% level and its coefficient falls by about half. Besides the significant within group impact of GDP per capita within the three income groups, there is a significant difference in the long run pass through between the rich countries on the one hand and the middle income and poor countries on the other hand.

In the fifth and sixth columns we add dummies for Africa.[19] The long run pass through is 5% to 10% lower in African countries, depending on the specification and controlling for GDP per capita and GDP

Table 2: Effect of GDP per capita and continent dummies on long run pass through

	(1) LRPT	(2) ln(LRPT)	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT
GDP PC	-4.4e-06***		-8.3e-06***	-2.1e-06**	-1.0e-05***	-2.2e-06**
	(5.5e-07)		(1.8e-06)	(9.7e-07)	(2.0e-06)	(9.4e-07)
ln(GDP PC)		-.28***				
		(.035)				
GDP PC Squared			9.6e-11**		1.3e-10***	
			(4.4e-11)		(4.5e-11)	
Poor				.1**		.16***
				(.039)		(.043)
Middle				.074***		.09***
				(.028)		(.028)
Africa					-.073**	-.098***
					(.03)	(.032)
Constant	.24***	.57*	.26***	.17***	.29***	.17***
	(.013)	(.33)	(.016)	(.028)	(.019)	(.027)
Observations	147	140	147	147	147	147
R^2	0.30	0.32	0.33	0.34	0.35	0.38
Adjusted R^2	0.30	0.31	0.32	0.33	0.34	0.37
BIC	-281.13	240.81	-286.05	-279.61	-287.18	-284.16

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Effect of GDP per capita and continent dummies on long run pass through with lagged dependent variables in the pass through regression

	(1) LRPT	(2) ln(LRPT)	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT
GDP PC	-1.4e-06***		-3.0e-06***	-4.9e-07	-4.2e-06***	-5.2e-07
	(2.5e-07)		(7.8e-07)	(4.5e-07)	(8.3e-07)	(4.2e-07)
ln(GDP PC)		-.3***				
		(.061)				
GDP PC Squared			4.2e-11**		6.2e-11***	
			(1.9e-11)		(1.9e-11)	
Poor				.04**		.074***
				(.016)		(.018)
Middle				.025**		.034***
				(.013)		(.012)
Africa					-.042***	-.056***
					(.012)	(.013)
Constant	.052***	-.99*	.06***	.026**	.075***	.027**
	(.0056)	(.56)	(.0067)	(.012)	(.0078)	(.012)
Observations	147	114	147	147	147	147
R^2	0.17	0.17	0.19	0.20	0.25	0.29
Adjusted R^2	0.16	0.17	0.18	0.18	0.24	0.27
BIC	-508.63	320.88	-513.71	-504.85	-520.13	-516.77

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

per capita squared or dummies for income groups. The other continent dummies are not significant, both when including them one at a time and when including them all together. This indicates that pass through patterns in other continents do not deviate from those in the rest of the world.[20] Ferrucci et al. (2012) study food price pass through within the EU and argue that internal EU prices should be used for raw food as EU prices are largely insulated from world food prices due to the CAP. In our study a dummy for EU countries is not significant, implying that pass through of world food prices in EU countries is not smaller than in countries with comparable income levels.

Table 3 shows that we get similar results for the long run pass-throughs based on the parsimonious specification with lagged dependent variable(s). The elasticity of the long run pass through (LRPT) is almost identical (0.3 versus 0.28). There are two main differences. First, the estimated coefficients for the regressions in levels (column 1 and columns 3-6) are smaller. Second, the effect of GDP per capita becomes insignificant in the specifications with income group dummies. This indicates that the effect of GDP per capita is driven by differences between groups of countries (rich, middle-income, and poor) and

Table 4: Description of Trade Integration Variables

Variable	Description	Source
Port Infra	Quality of Port Infrastructure from business executives surveys of port facilities	World Economic Forum
Import Cost	All official fees levied on importing a 20-foot container	WB Doing Business
NRA	National rate of assistance in the total agricultural sector including decoupled payments and non product specific assistance reflecting trade related and domestic distortions in agriculture	Anderson et al. (2008)
TRI	Uniform tariff equivalent of tariff and non-tariff measures in agriculture based upon MFN tariffs	Kee, et al. (2009)
IDR	Food imports divided by food absorption (food production plus food imports minus food exports)	FAO

that there is no significant difference in pass through within the three groups of countries.

4.3 pass through and Market Integration

As a next step we explore the possible influence of the degree of market integration, represented by the term ε_{mi} in equation (2). We study three types of measures of market integration: geography and infrastructure related trade cost measures, policy related trade cost measures and trade outcome measures. Table 4 provides an overview of the variables included in the regressions. The expectation is that countries with a lower degree of market integration have a lower long run pass through. The role of geography and infrastructure is evaluated using a landlocked dummy and indicators collected by the World Bank on the quality of infrastructure.[21] Policy related trade costs are measured with three different types of data. First, the trade cost measures on the costs of doing business internationally collected by the World Bank (Doing Business, 2012)[22]; second, the national rate of assistance (NRA) measuring both trade related and domestic distortions in agriculture, collected by Anderson et al. (2008); third, the trade restrictiveness index (TRI) measuring the uniform tariff equivalent of tariff and non-tariff barriers to trade (Anderson and Neary, 1994), calculated for the agricultural sector by Kee, et al. (2009).[23] As trade outcome measure we include the import dependency ratio (IDR) in the regression, calculated from FAO data as food imports divided by food absorption (food production plus food imports minus food exports).

We control for GDP per capita and GDP per capita squared in all regressions, based upon the results in Tables 2 and 3. So, the regression in column two of table 2 serves as a baseline. We add the different market integration measures one at a time to the baseline specification and include the significant measures all together in the end. Because the sample size falls too much when including all

Table 5: Effect of market integration on long run pass through

	(1) LRPT	(2) LRPT	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT	(7) LRPT
GDP PC	-0.0000098***	-0.0000096***	-0.000010***	-0.000011***	-0.000011***	-0.000015**	-0.000011***
	(0.0000024)	(0.0000019)	(0.0000029)	(0.0000037)	(0.0000025)	(0.0000067)	(0.0000039)
GDP PC Squared	1.2e-10**	1.3e-10***	1.5e-10**	1.5e-10	1.5e-10***	2.5e-10	1.7e-10*
	(5.2e-11)	(4.4e-11)	(7.3e-11)	(9.6e-11)	(5.3e-11)	(1.7e-10)	(9.9e-11)
ln(Port Infra)	0.062					-0.020	
	(0.048)					(0.085)	
ln(Import Cost)		-0.053***				0.00039	-0.011
		(0.020)				(0.035)	(0.023)
NRA			-0.038				
			(0.024)				
ln(TRI)				-0.036***		-0.031	-0.035***
				(0.011)		(0.019)	(0.011)
ln(IDR)					0.025**	0.018	
					(0.011)	(0.021)	
Constant	0.18***	0.64***	0.28***	0.18***	0.30***	0.25	0.26
	(0.064)	(0.14)	(0.024)	(0.029)	(0.028)	(0.31)	(0.17)
Observations	128	146	74	86	100	57	86
R^2	0.32	0.36	0.41	0.47	0.34	0.45	0.47
Adjusted R^2	0.30	0.35	0.38	0.45	0.32	0.38	0.45
BIC	-241.97	-286.20	-155.79	-168.10	-184.49	-81.64	-163.89

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

variables at the same time and because of the problem of multicollinearity between the different trade policy measures, we could not follow a Wald-based strategy. Instead we evaluated the importance of the different market-integration-variables by including the different variables one at a time.[24]

Table 6: Effect of market integration on long run pass through with lagged dependent variables in the pass through regression

	(1) LRPT	(2) LRPT	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT	(7) LRPT
GDP PC	-0.0000034***	-0.0000035***	-0.0000030**	-0.0000044**	-0.0000038***	-0.0000037	-0.0000049***
	(0.0000010)	(0.00000079)	(0.0000011)	(0.0000018)	(0.0000010)	(0.0000031)	(0.0000018)
GDP PC Squared	4.8e-11**	5.4e-11***	5.0e-11	8.0e-11*	5.4e-11**	6.2e-11	9.3e-11*
	(2.2e-11)	(1.9e-11)	(3.1e-11)	(4.7e-11)	(2.2e-11)	(7.7e-11)	(4.7e-11)
ln(Port Infra)	0.0095					-0.0056	
	(0.021)					(0.042)	
ln(Import Cost)		-0.023***				-0.019	-0.021*
		(0.0087)				(0.016)	(0.011)
NRA			-0.015				
			(0.011)				
ln(TRI)				-0.017***		-0.012	-0.014**
				(0.0059)		(0.0089)	(0.0060)
ln(IDR)					0.0032	-0.0079	
					(0.0050)	(0.010)	
Constant	0.050*	0.23***	0.060***	0.021	0.069***	0.16	0.17**
	(0.028)	(0.063)	(0.0094)	(0.015)	(0.012)	(0.15)	(0.085)
Observations	128	146	74	86	100	57	86
R^2	0.21	0.23	0.26	0.24	0.25	0.33	0.27
Adjusted R^2	0.19	0.22	0.23	0.22	0.22	0.25	0.24
BIC	-441.95	-512.03	-282.01	-271.86	-353.77	-167.20	-270.90

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

We start in the first column of table 5 with the impact of infrastructure, using as measure the quality of port infrastructure collected by the World Economic Forum's Executive Opinion Survey (Schwab, 2012). Although the coefficient has the right sign – a better port infrastructure raises the pass through – it is not significant. Other measures like the percentage of paved roads, the liner shipping connectivity index measuring the connection to global shipping routes or a logistics performance index all have the wrong sign and are not significant. The wrong coefficient probably reflects that richer countries have better logistics and part of the GDP per capita effect is picked up by the logistics measure.[25] We also explored the effect of being landlocked, but its effect on pass through is not significant. Minot (2010) finds a larger pass through in landlocked countries in a study of food pass through of African countries,

speculating that the larger price increases in landlocked countries might be caused by the co-movement of world food and world fuel prices and food prices in landlocked countries being affected more by increases in fuel prices. We find a highly insignificant coefficient of landlocked restricting the sample to African countries.

Next we move to policy related trade costs. The first variable in this respect is import costs as collected by the World Bank, measuring the official fees levied on a 20-foot container imported into the country. Its coefficient has the right sign and is strongly significant. Larger fees to import a container reduce the pass through. Export costs, measured in the same way as import costs, the number of days to import and the number of days to export, measuring the number of days needed to comply with all procedures to import or export goods, and a variable measuring the burden of custom procedures also have a significant negative impact on the long run pass through.

The second policy related trade cost variable is the national rate of assistance (NRA). There are several NRA measures and we work with the national rate of assistance in the total agricultural sector including decoupled payments and non product specific assistance. Column three shows that controlling for GDP per capita this variable has a negative impact on pass through, as expected. The coefficient is, however, not significant. Also other NRA measures are not significantly related to the long run pass through.

The third policy related variable is the trade restrictiveness index (TRI) in agricultural products. Column four shows that the TRI based upon MFN tariffs has a highly significant negative impact on the pass through, as expected. Also the other TRI measures in the agricultural sector, based upon MFN tariff and non tariff barriers and based upon applied tariffs and applied tariff and non tariff barriers affect the pass through negatively and significantly, but the effect is not as large as for the TRI based upon MFN tariffs.

In column five we move to the trade outcome measure IDR, the import dependency ratio. The effect of a larger import dependency ratio on the pass through is positive and significant at the 5% level. So, countries more dependent upon imports display higher pass-throughs, as expected.

Next, in column six we include all significant trade cost measures in the regression. As a result of the

small number of observations, 57, and the inclusion of highly-correlated variables all market integration variables become insignificant. Only GDP per capita stays significant with the correct sign. To examine the relative importance of the different significant trade policy variables in the larger sample we regress in column seven the pass through on per capita GDP, per capita GDP squared, import costs and the TRI-measure. The coefficients on both import costs and the TRI-measure keep the right sign, but only the TRI-measure stays significant.

We take three lessons away from the analysis on the effect of market integration on pass through. First, market integration does matter and the policy related component of market integration seems to be most important. The infrastructure and geography measures instead do not have a significant impact. [26] Second, import costs can explain part of the lower pass through in Africa. Repeating the regressions in table 5 including the dummy for Africa shows that the coefficient on the African dummy becomes smaller after adding import costs to the regression. This is not the case for the other market integration measures.[27] Third, the impact of GDP per capita remains strongly significant and the effect becomes even more profound in most cases once controlling for market integration.[28]

5 Robustness Checks

We conduct five sets of robustness checks, extending the basic estimation framework in several directions, confirming the results of the main analysis. Detailed results are presented in the web appendices. First, we tested for the existence of cointegration between the world food price index and the local food price index. Engle-Granger tests indicate that the residual series are stationary implying the presence of a cointegration relationship only in three cases. Johansen tests instead provide support for cointegration in 42 countries. Therefore, as a robustness check we estimated a VEC model for these 42 countries and analysed the resulting long run pass through. The cointegration results confirm the baseline estimation results on the role of income. The long run pass through is strongly correlated with per capita income, although the relation is not non-linear given the insignificance of the quadratic income per capita term. The market integration variables, though, do not have a significant impact on the cointegration pass

through.

Second, we addressed endogeneity of exchange rates to local food prices. Thereto, we estimated a tri-variate VAR for each country with world food prices, local food prices, and exchange rates as included variables. We first determined the number of lags with the Akaike information criterion (AIC) and then ran Granger causality tests for the significance of local food prices and the joint significance of local and world food prices in the equation explaining the exchange rate. We isolated all countries for which we failed to reject at the 10% level that local food prices have an effect on (Granger cause) the exchange rate, either directly or indirectly through world food prices. We subsequently re-estimated the second step regressions explaining the long run pass through, dropping these countries. Based on our test, 57 out of the 147 countries had to be dropped. With the limited sample of countries, all our results on the effect of income per capita, continents, and market integration carry through. The results on some variables become more significant. In particular, NRA displays a significant negative coefficient, as expected.

Third, we addressed possible endogeneity of world food prices in three ways. First, we repeated estimation of the pass through omitting the contemporary lag on the right hand side and conducted the same analysis as above. Second, we repeated the analysis omitting the 12 biggest food exporters. Most of the conclusions from the main analysis remain intact, only port infrastructure becomes insignificant in both cases. Third, we estimated a tri-variate VAR with world food prices, local food prices, and exchange rates as included variables as described in the previous point. Similar to the approach for endogeneity of the exchange rate we dropped the countries for which we failed to reject at the 10% level that local food prices have an effect on the world food price, either directly or indirectly through exchange rates. We then re-estimated the second-step regressions, dropping 51 of the 147 countries. With the limited sample we find almost identical results. Two results change: GDP per capita squared and the import dependency ratio become insignificant.

Finally, as fourth and fifth robustness checks, we repeated on the one hand estimation of the pass-throughs with 12 and 18 lags and on the other hand used the Akaike information criterion (AIC) to select the lag length in the estimation with a lagged dependent variable. In both cases the main results remain as in the baseline regressions.

6 Concluding Remarks

While we may live in a world where food markets are global, the relevance of food prices for consumers is ultimately local. In this context, the impact of global food price increase on patterns of food security at the local level hinges on the mechanics of local food price transmission from primary commodities to the final consumption bundle. As such, the food security debate weaves patterns of price transmission together with poverty, politics, and the determinants of trade policy. In this respect, the literature links past episodes of price spikes to worsening poverty, especially in urban areas of food importing countries, and to episodes of political and social unrest (Dessus et al. (2008); Ivanic and Martin (2008); and Ivanic et al. (2012); Bellemare (2014)). At the same time, climate science provides warnings of potential future disruptions in the stability of food systems from increased short-term variability in supply, as well as warnings of the risk that increased short-run disruptions may eventually translate into long run supply shocks (Battisti and Naylor (2009); Wheeler and Von Braun (2013)).

In this paper, we focus on quantifying the extent to which global food price movements translate into local changes in food prices for consumers. We place emphasis on systemic cross-country variations in the pattern of price transmission. In particular, we have estimated food price pass through for a large sample of countries, and then analyzed the determinants of variations in pass through. We find that while market integration does play a role in the form of policy related trade costs, income per capita is a stronger and more robust determinant of pass through. Our results support the view that there is a structural basis for greater relative impact at the consumer level in lower-income countries. From a policy perspective, this means that global price increases (both spikes and any long-term supply shocks) will more adversely impact low-income consumers (especially those who are food consumers rather than producers). At the same time, in our view this means that the propensity of high income countries to insulate their consumers from price movements serves to push adjustment burdens further onto those already more adversely affected.[29] In our view, the cross country pattern of linkages from world to local prices means that future designs of policy responses should take into account the roles of both the level of income and of market integration. (Basically, the poor are more vulnerable, and this matters).[30]

To evaluate the success of different countries to insulate themselves from world food price changes, we should take into account that countries with similar income per capita levels and similar levels of pass through might actually be very different. Comparing for example Kenya (estimated pass through of 0.090 in Table 8) and Malawi (estimated pass through of -0.041 in Table 8) seems to indicate fairly similar pass through levels. But the situations in the two countries are very different (See for example Baltzer (2013)). Kenya has been fairly successful in realising a low degree of pass through and therefore stable local prices. Malawi instead has a low degree of pass through because most of the variation in food prices is driven by local events such as local weather shocks, thus leading to sufficient price volatility irrespective of the low international price transmission to local prices.

Beyond direct vulnerability to world food prices on the demand side, less obvious is the implication of strong income growth in emerging countries on world food price levels and volatility, and the subsequent impact on countries that remain behind. As a subset of emerging countries grow, a larger share of their food consumption will consist of additional margin services, with a consequent fall in pass through rates. This means that temporary swings and possible structural increases in the prices of primary food will have a smaller impact on the price of consumed food in these countries. As such, future shocks will be accommodated less by adjustments in demand in these countries, yielding an even larger impact on primary food prices. Resulting prices may then display even larger swings, with remaining lower income countries facing even greater price shocks.

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Notes

[1]According to the FAO, since 1961, earlier food price spikes occured in 1972-74, 1988, and 1995 (FAO 2009). Causes included a supply side mix of weather and export restrictions in certain key supplier markets. In3the more recent episodes, demand factors, including biofuel policy, have added to this mix. On the supply side, price volatility can discourage producers unable to hedge properly, and otherwise encourage a move to cash crops (FAO 2009). Of course, policies aimed at greater agricultural producvitiy, coupled with proper risk management mechanisms, may encourage greater domestic supply and home consumptiom. Though again, as shown by the recent episodes with biofuel demand, unintended demand management may direct domestic growth in production to non-food final demand channels.

[2]The effective transmission of food prices also depends on the effective integration of domestic markets within a country and not only on national integration with global markets. The analysis (and underlying data) we work with here focus on national levels of transmission, and generally our consumer price data series, coming from national agencies, reflect national trends. There can at the same time be substantial within country variation, especially in lower income countries. See for example Cudjoe, et al. (2010).

[3]Countries with relatively stable exchange rates vis-a-vis the USA were selected for this figure. The fact that local food prices in the poor African country Gabon seem relatively insulated from world food price movements is reflecting that African countries have a significantly lower passthrough than other countries, controlling for income levels. We explore this later in the paper.

[4]Hence we relate the relative change in local food prices to the relative change in world food prices.

[5]A second, alternative explanation for the lower pass through in richer countries is that these countries tend to impose restrictions to shelter their agricultural producers from international competition (see for example Anderson et al. (2014) on price insulation in response to the food price rises of 2007-2008). However, controlling for different restrictive policy measures we find that GDP per capita is still a highly significant determinant of food price pass through.

[6]See for further discussion Baltzer (2013). The role of margin services in exchange rate pass through is explored in Burstein et al. (2003) and Francois et al. (2013) without relating it to income per capita. Yang el al (2015) focus specifically on margin service costs and income levels in a computational (CGE) model based assessment of passthrough of food price shocks.

[7]Passthrough was estimated as well at the aggregate level for more than 70 countries in IMF (2011), but these authors did not attempt to formally explain the variation in passthrough. Meyer and von Cramon (2004) and Vavra and Goodwin

(2005) survey the earlier literature on food price pass through and Fackler and Goodwin (2001) go into the broader question of spatial price transmission.

[8]With nonhomothetic preferences we get identical results (see Appendix A), but the exposition with homothetic preferences is clearer.

[9]As discussed below, in our data local prices are measured in local currencies and international prices in dollars. Therefore we include the exchange rate E.

[10]Perfect market integration implies in our definition that there is a single market with a single price, thus guaranteeing equality of local and international prices. Hence our definition of market integration also requires the market to be spatially integrated without disparities across different locations.

[11]One direct implication of the present analysis is that whatever the final demand elasticity for a particular final food product, the derived elasticity for the underlying (un-processed, pre-value added) product will be lower, the smaller the share of the primary food product in final demand. We know for example from Yang el al (2015) that these shares are lower in high income countries. In other words, given final demand elasticities and Balassa Samuelson effects, our econometric estimates are fully consistent with lower derived demand elasticities in high income countries. Engel effects will serve to reinforce further a pattern of lower derived demand elasticities in high income countries.

[12]Based upon unit root tests, we estimate the relationship between local food prices and world food prices in first differences. We allow for AR1 disturbances in order to eliminate autocorrelation.

[13]We do not think that the omission of a local price index of food services creates an omitted variable bias problem, as services prices tend to remain constant on a monthly basis and only change over longer time horizons. We did not explore this assertion in the data since data on services prices are only available on a yearly basis for our large sample of countries.

[14]The weighted average across countries of the t-statistics of the difference in the world food price index and the exchange rate long run passthrough is 2.61 with 15 lags. This implies that we have to reject the hypothesis that the long run passthroughs are equal. Including more than 10 lags the average t-statistic is exceeding 2, so this result is robust to variation in lag length.

[15]In the web appendix we report the results of an analysis of the determinants of the exchange rate passthrough. We argue that we should not attach too much value to these results. The reason is that countries with fixed exchange rates and only some realignments bias the results on the analysis of the exchange rate passthrough.

[16]In theory, the domestic consumer price indexed components (food, energy, household goods, clothing, etc) are meant to represent prices for quality constant units (see Triplett (2004)). How this works out in practice varies across countries, of course, and we admit to have no way to really identify and control for problems in this area with the data.

[17]In Appendix B we present the long run passthroughs estimated in the first stage.

[18]Since estimation in logs drops the negative long run passthrough observations, it is fair to drop the outliers on top as well. The elasticity is still -0.28 after omitting the countries with a long run passthrough larger than 1 and remains highly

significant. To evaluate the impact of dropping the negative observations, we also ran the levels regression without the negative observations. The coefficient on GDP per capita becomes about 10% larger, indicating that dropping the negative observations leads to a somewhat higher elasticity in the logs regression (results in web appendix).

[19]In the webappendix we included dummies for all other continents, Asia, North-America, South-America, Oceania, and Europe, both all together and one at a time. All dummies except for the African dummy are insignificant when also GDP per capita is included, whereas GDP per capita always remains strongly significant.

[20]This result as well as several results mentioned below but not shown in the tables of the main text are presented in web appendices.

[21]"The quality of infrastructure data are from Doing Business (2012) and the World Economic Forum's Executive Opinion Surevy (Schwab, 2012) and measure "business executives percentation of their country's port facilities" with scores ranging from 1 to 7." Source: data.worldbank.org/topic/private-sector.

[22]In the main text we work with the variable import cost defined as follows. "Import cost measures the fees levied on a 20-foot container in U.S. dollars. All the fees associated with completing the procedures to export or import the goods are included. These include costs for documents, administrative fees for customs clearance and technical control, customs broker fees, terminal handling charges and inland transport. The cost measure does not include tariffs or trade taxes. Only official costs are recorded. Source: data.worldbank.org/topic/private-sector"

[23]"The OTRI captures the trade policy distortions that each country imposes on its import bundle. It measures the uniform tariff equivalent of the country's tariff and non-tariff barriers." Source: Kee, et al. (2009).

[24]We checked the impact of influential data points and report the results where relevant.

[25]The variable time to export, measuring the mediam time from shipment to port of loading, has a significant negative impact on the long run pass through as expected. This variable is, however, affected both by the port infrastructure and policy-related trade costs and supports our evidence below that policy-related trade costs are significantly related to the pass through.

[26]We cannot evaluate the impact of variation in markup adjustments as a result of variation in concentration and market power in the retail sector in our broad sample, because of a lack of data. OECD (Conway, 2005; Woelfl, 2009) reports indices of product market regulation in retail trade for up to 40 countries. We examined the impact of these indices on the long run food price pass through. We find, interestingly, that upper and lower price controls have a significant impact on the passthrough and display the correct sign: more price controls lead to a lower food price pass through.

[27]The additional results are in the web appendix. In the case of the NRA and TRI the African dummy becomes insignificant in the reduced sample without including the NRA and TRI themselves. So, the sample size drives the insignificance and not the inclusion of the market integration measures themselves.

[28]Rich countries tend to shelter their agricultural producers from the international market. We have tried to capture this by including different measures of market integration like import costs, trade restrictiveness (TRI), and national rates of

protection (NRA) in agriculture. After including these variables GDP per capita stays strongly significant, indicating that GDP per capita has an impact beyond its effect through trade policy

[29]Farmers in poor countries could benefit from higher prices, but they will also lose from lower prices and more generally from volatility in world food prices strongly affecting local food prices and thus creating uncertainty. Moreover, when it comes to the impact on the poor the UN (2014) reports that in sub-Saharan Africa and Asia, 40% and 48% respectively of the local population lives in urban areas. These shares are projected to increase to 56% and 64% respectively by 2050. These urban populations are generally food consumers rather than producers.

[30]A good policy related to food price transmission should combine short run insulation (over two to three years) from food price changes with a high level of long run market integration to provide the richt incentives to farmers and consumers. We have only evaluated the first component, the determinants of food price transmission in the short run. The study by Valenzuela et al. (2007) attempts to model the long run effects of active market insulation by importers in the GTAP model by matching price volatility in the data and in the model. But this paper is not focused on poverty impacts of food price volatility.

Appendix A Nonhomothetic Preferences

In this appendix we demonstrate that with nonhomothetic preferences we get identical results as those reported in the main text with homothetic preferences.

Assume the demand across primary food and food services is nonhomothetic. We can then write the average spending on total food consumption $\widetilde{P}_f$ (as a proxy for its price) as the minimum expenditure on total food $\widetilde{G}\left(P_{pf}, P_{sf}\right)$ divided by the consumption of primary food $\widetilde{Q}_f$:

$$\widetilde{P}_f = \frac{\widetilde{G}\left(P_{pf}, P_{sf}\right)}{\widetilde{Q}_f} \tag{C.1}$$

Log differentiating equation (C.1) and applying Shephard's lemma generates an expression for the relative change of $\widetilde{P}_f$:

$$\widehat{\widetilde{P}_f} = \frac{Q_{pf} P_{pf}}{\widetilde{P}_f \widetilde{Q}_f} \widehat{P_{pf}}$$

Hence, the elasticity of total food prices with respect to primary food prices generates an expression for the primary food share also with non-homothetic preferences.

Appendix B First Stage Results and Motivation Specification

In this section we present the first stage estimation results and unit root tests on the local food price indices, discuss into more detail how the lag length was selected and provide further motivation for entering the world food price index and the exchange rate as separate regressors.

Augmented Dickey Fuller (ADF) tests on local consumer price indices for each country show that only in the case of Suriname and Romania we can reject the presence of a unit root. Running ADF tests on the first differences of the local food price indices shows that for all countries we can reject the presence of a unit root, except for Zimbabwe, which is dropped from the sample because of hyperinflation. This analysis implies that the pass through equations should be estimated in first differences.

Figure 2: The average long run passthrough calculated including an increasing number of lags in the passthrough regressions

To select the lag length we applied the rule in Nakamura and Zerom (2012) that the long run pass through does not change anymore upon adding additional lags. To implement this rule we estimated the long run pass through for each country in the sample and calculated the weighted average long run pass through across all countries.[31] Figure 2 displays the weighted average long run pass through as a function

Table 7: first stage long run passthroughs in different countries

Country	LRPT	Country	LRPT	Country	LRPT
Albania	0.122	Grenada	0.218*	Nigeria	0.229
Algeria	-0.085	Guatemala	0.194*	Norway	0.016
Angola	0.000	Guinea	0.435*	Oman	0.398*
Argentina	0.064	Guinea-Bissau	0.412*	Pakistan	0.446*
Armenia	0.523*	Guyana	0.328*	Panama	0.234*
Austria	0.125*	Haiti	0.490*	Paraguay	0.467*
Bahamas	0.130*	Honduras	0.314*	Peru	0.155*
Bahrain	0.067	Hong Kong	0.212*	Phillipines	0.193*
Bangladesh	0.126*	Hungary	0.277*	Poland	0.244*
Barbados	0.238*	Iceland	0.122	Portugal	0.122*
Belarus	0.451*	India	0.194	Romania	0.273*
Belgium	0.100*	Indonesia	0.166	Russia	0.215
Benin	0.361*	Iran	0.583*	Rwanda	0.261
Bolivia	0.279*	Ireland	0.194*	Saint Lucia	0.096
Botswana	0.189*	Israel	0.273*	Saint Vincent	0.293*
Brazil	0.277*	Italy	0.071*	Samoa	0.225
Brunei	0.136*	Ivory Coast	0.312*	Saudi Arabia	0.226*
Burkina Faso	0.529*	Jamaica	0.305*	Senegal	0.275*
Burundi	0.688	Japan	0.048	Seychelles	0.194
Cambodia	0.342*	Jordan	0.298*	Sierra Leone	0.393*
Cameroon	0.178*	Kazakhstan	0.469*	Singapore	0.126*
Canada	0.067*	Kenya	0.331*	Slovakia	0.236*
Centr. African Rep.	0.377	Kuwait	0.331*	Slovenia	0.149*
Chad	0.312	Kyrgyzstan	-0.097	Solomon Islands	0.397*
Chile	0.289*	Laos	0.294	South Africa	0.244*
China	0.386*	Latvia	0.409*	South Korea	0.131
Colombia	0.165*	Lesotho	0.173*	Spain	0.078
Congo	0.155	Lithuania	0.446*	Sri Lanka	0.5*
Costa Rica	0.409*	Luxembourg	0.090*	Suriname	0.184
Croatia	0.203*	Macedonia	0.398*	Swaziland	-0.675
Cyprus	0.234*	Madagascar	0.430*	Sweden	0.137*
Czech Republic	0.351*	Malawi	-0.097	Switzerland	0.021
Denmark	0.185*	Malaysia	0.180*	Syria	0.105
Dominica	0.164*	Maldives	0.526*	Taiwan	0.189
Dominican Rep.	0.236	Mali	0.280*	Tanzania	0.181
Egypt	0.203*	Malta	0.171*	Thailand	0.143*
El Salvador	0.316*	Mauritania	0.065	Togo	0.328*
Eq. Guinea	0.083	Mauritius	0.372*	Tonga	0.160
Estonia	0.340*	Mexico	0.075	Trin. and Tobago	0.119
Ethiopia	1.324*	Moldava	0.252	Tunisia	-0.054
Fiji	0.206	Mongolia	1.536*	Turkey	0.261*
Finland	0.280*	Morocco	0.035	Uganda	0.421*
France	0.068*	Mozambique	0.287*	Ukraine	0.578*
Gabon	0.165	Namibia	0.180*	United Kingdom	0.224*
Gambia	0.236*	Nepal	0.196	United States	0.097*
Georgia	0.190	Netherlands	0.087*	Uruguay	0.236*
Germany	0.148*	New Zealand	0.200*	Venezuela	-0.009
Ghana	0.020	Nicaragua	0.386*	Vietnam	0.625*
Greece	0.101	Niger	0.421*	Zambia	0.093

Long-run passthroughs (LRPTs) with a * are significantly larger than 0 at the 5percent level

Table 8: first stage long run passthroughs in different countries

Country	LRPT	Country	LRPT	Country	LRPT
Albania	0.112*	Grenada	0.150*	Nigeria	0.008
Algeria	-0.137	Guatemala	0.054*	Norway	-0.007
Angola	-0.075	Guinea	0.231*	Oman	0.178*
Argentina	0.035	Guinea-Bissau	-0.007	Pakistan	0.136*
Armenia	0.150*	Guyana	0.096*	Panama	00
Austria	0.004	Haiti	0.209*	Paraguay	0.244*
Bahamas	-0.001	Honduras	0.067	Peru	0.023
Bahrain	-0.013	Hong Kong	0.122*	Phillipines	0.046*
Bangladesh	0.083*	Hungary	0.054	Poland	0.017
Barbados	-0.006	Iceland	-0.009	Portugal	0.021
Belarus	0.068	India	0.081*	Romania	0.170*
Belgium	0.028*	Indonesia	0.004	Russia	0.097*
Benin	-0.003	Iran	0.145*	Rwanda	-0.037
Bolivia	0.090*	Ireland	0.037	Saint Lucia	-0.019
Botswana	-0.018	Israel	0.059*	Saint Vincent	0.029
Brazil	0.108*	Italy	0.017	Samoa	0.014
Brunei	0.027*	Ivory Coast	0.028	Saudi Arabia	0.067*
Burkina Faso	0.158*	Jamaica	0.059	Senegal	0.085*
Burundi	0.291*	Japan	-0.008	Seychelles	0.046
Cambodia	0.244*	Jordan	0.104*	Sierra Leone	0.003
Cameroon	0.002	Kazakhstan	0.090	Singapore	0.019
Canada	-0.020	Kenya	0.090	Slovakia	0.041
Cent. African Rep.	0.008	Kuwait	0.048	Slovenia	0.035
Chad	-0.052	Kyrgyzstan	-0.048	Solomon Islands	0.012
Chile	0.030	Laos	0.028	South Africa	0.001
China	0.142*	Latvia	0.064*	South Korea	0.017
Colombia	-0.016	Lesotho	-0.013	Spain	0.028
Congo	-0.115	Lithuania	0.090*	Sri Lanka	0.200*
Costa Rica	0.078	Luxembourg	0.012	Suriname	0.050
Croatia	0.024	Macedonia	0.104*	Swaziland	-0.046
Cyprus	0.054	Madagascar	0.061	Sweden	0.009
Czech Republic	-0.012	Malawi	-0.041	Switzerland	-0.014
Denmark	0.006	Malaysia	0.026	Syria	0.127
Dominica	0.072*	Maldives	0.127	Taiwan	0.013
Dominican Rep.	0.123*	Mali	0.057	Tanzania	-0.056
Egypt	0.082*	Malta	0.004	Thailand	0.014
El Salvador	0.093*	Mauritania	0.064*	Togo	-0.035
Eq. Guinea	-0.008	Mauritius	0.068*	Tonga	0.037
Estonia	0.174*	Mexico	-0.008	Trin. and Tobago	-0.075
Ethiopia	0.519*	Moldava	0.189*	Tunisia	0.018
Fiji	0.035	Mongolia	0.142	Turkey	0.153*
Finland	0.013	Morocco	0.017	Uganda	0.207*
France	0.017	Mozambique	0.101*	Ukraine	0.261*
Gabon	0.012	Namibia	0.028	United Kingdom	0.025
Gambia	0.059	Nepal	0.071*	United States	0.017*
Georgia	0.136*	Netherlands	-0.004	Uruguay	0.112*
Germany	0.035*	New Zealand	0.034	Venezuela	-0.209
Ghana	-0.004	Nicaragua	0.048	Vietnam	0.172*
Greece	-0.003	Niger	0.016	Zambia	-0.071

Long-run passthroughs (LRPTs) with a * are significantly larger than 0 at the 5percent level

of lag length. We defined the lag length at which the long run pass through stabilises is defined as the lag length where the relative difference in long run pass through with the average of long run pass-throughs with 1 and 2 lags less is smaller than a certain threshold (5%). This rule generates a lag length of 15 to be used in the estimations.

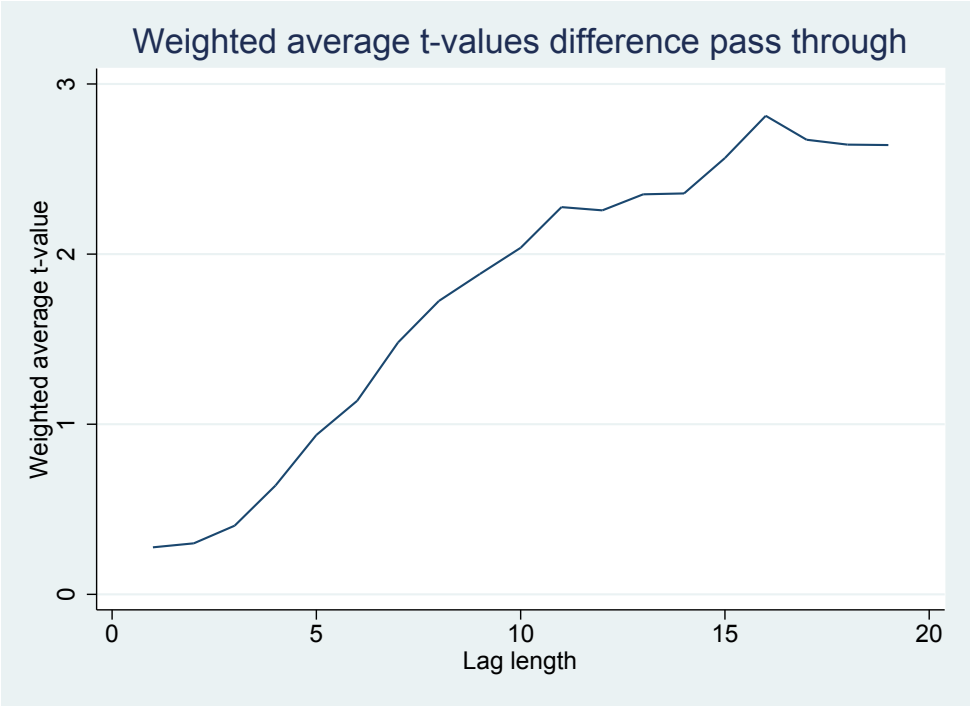

Figure 3: Weighted average t-values across countries of the difference in the world food price index and exchange rate long run passthrough including an increasing number of lags in the passthrough regressions

To motivate the inclusion of the world food price index and the exchange rate as separate regressors we determined the t-values of the difference in the world food price index long run pass through and exchange rate long run pass through for all countries at varying lag length. We calculated the weighted average of these t-values across all countries in the sample with as weights the variance of the test statistic. At 15 lags we find an average t-statistic of 2.61. We can hence reject equality of the world food price index and exchange rate long run pass through. Figure 3 displays the evolution of the weighted t-statistic as the lag length rises. We see that for larger lag lengths (more than 10 lags) the t-statistic is larger than 2.

Supplementary appendices

Appendix C Additional Regression Results

This appendix shows several additional regression results alluded to in the main text. The effect of estimating the impact of GDP per capita in logs and thus dropping the negative long run pass through observations is displayed in table 9. Columns 1 and 2 display estimation in levels with in column 1 the full sample and in column 2 the countries with a negative long run pass through dropped. The coefficient rises somewhat in the smaller sample in absolute terms (from column 1 to column 2). Dropping the observations with a pass through larger than 1 does not have any influence as becomes clear by comparing columns two and three and columns four and five (in logs).

Table 9: Effect of dropping observations with negative long run pass through

	(1) LRPT	(2) LRPT	(3) LRPT	(4) ln(LRPT)	(5) ln(LRPT)
GDP PC	-4.4e-06***	-4.8e-06***	-4.7e-06***		
	(5.5e-07)	(5.3e-07)	(5.1e-07)		
ln(GDP PC)				-.28***	-.28***
				(.035)	(.035)
Constant	.24***	.25***	.25***	.57*	.56*
	(.013)	(.013)	(.012)	(.33)	(.34)
Observations	147	140	138	140	138
R^2	0.30	0.37	0.38	0.32	0.31
Adjusted R^2	0.30	0.36	0.38	0.31	0.31

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The influence of including measures of market integration on size and significance of the African dummy is analysed in table 10. The table shows for each of the market integration measures how the African dummy changes when including the market integration measure in the regression. The sample size is kept constant, so we start in column one with the effect of GDP per capita and the African dummy on the long run pass through for the sample of countries for which data on port infrastructure are available. In column two we then add port infrastructure to the regression. The following columns display the results of the same exercise on import costs and export costs and in table 11 the results are

shown for the NRA, TRI and IDR. Table 11 shows that the African dummy is sensitive to the sample of countries included. The dummy is not significant in the reduced samples in columns 1, 3 and 5 without including the market integration variables. So, these exercises are not useful to answer the question whether the significant negative effect of the African dummy is driven by poor market integration in this continent. The results in table 10 are useful to answer this question. The port infrastructure measure cannot explain the significance of the African dummy, but the variable import costs can. Inclusion of this variable reduces the coefficient on the African dummy somewhat (columns 3 and 4). The results are similar for the variable export costs. So, the conclusion to be drawn from this exercise is that the significantly lower pass through in Africa can partially be explained by a trade policy generating higher costs of doing business internationally.

Table 10: Effect of including market integration measures on African dummy

	(1) LRPT	(2) LRPT	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT
Africa	-0.085***	-0.088***	-0.073**	-0.056*	-0.073**	-0.057*
	(0.032)	(0.032)	(0.030)	(0.030)	(0.030)	(0.030)
GDP PC	-0.000010***	-0.000013***	-0.000010***	-0.000011***	-0.000010***	-0.000011***
	(0.0000021)	(0.0000026)	(0.0000020)	(0.0000020)	(0.0000020)	(0.0000020)
GDP PC Squared	1.3e-10***	1.7e-10***	1.3e-10***	1.5e-10***	1.3e-10***	1.5e-10***
	(4.8e-11)	(5.3e-11)	(4.5e-11)	(4.6e-11)	(4.5e-11)	(4.6e-11)
ln(Port Infra)		0.071				
		(0.047)				
ln(Import Cost)				-0.043**		
				(0.020)		
ln(Export Cost)						-0.047**
						(0.023)
Constant	0.29***	0.20***	0.29***	0.59***	0.29***	0.61***
	(0.021)	(0.063)	(0.019)	(0.14)	(0.019)	(0.16)
Observations	128	128	146	146	146	146
R^2	0.35	0.36	0.35	0.37	0.35	0.37
Adjusted R^2	0.33	0.34	0.34	0.36	0.34	0.36
BIC	-247.25	-244.74	-285.01	-284.69	-285.01	-284.38

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 12 shows the impact of the different infrastructure based trade cost measures on the long run

Table 11: Effect of including market integration measures on African dummy

	(1) LRPT	(2) LRPT	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT
Africa	-0.030	-0.035	-0.021	-0.029	-0.058	-0.049
	(0.047)	(0.047)	(0.034)	(0.032)	(0.040)	(0.039)
GDP PC	-0.000011***	-0.000011***	-0.0000054	-0.000012***	-0.0000094***	-0.000014***
	(0.0000033)	(0.0000032)	(0.0000038)	(0.0000041)	(0.0000034)	(0.0000038)
GDP PC Squared	1.6e-10**	1.7e-10**	1.1e-11	1.8e-10*	9.1e-11	1.9e-10*
	(7.9e-11)	(7.9e-11)	(9.7e-11)	(1.0e-10)	(9.3e-11)	(9.9e-11)
NRA		-0.039				
		(0.024)				
ln(TRI)				-0.036***		
				(0.011)		
ln(IDR)						0.048**
						(0.020)
Constant	0.28***	0.29***	0.26***	0.19***	0.28***	0.36***
	(0.030)	(0.030)	(0.026)	(0.033)	(0.026)	(0.043)
Observations	74	74	87	86	91	91
R^2	0.39	0.41	0.39	0.48	0.33	0.37
Adjusted R^2	0.36	0.38	0.37	0.45	0.31	0.34
BIC	-153.50	-152.07	-160.09	-164.50	-147.32	-148.58

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

pass through.[32] Port infrastructure has the correct sign: a larger quality of port infrastructure raises the long run pass through of world food prices to local food prices, whereas Ship connectivity, the percentage of Paved roads and the Logistic performance index have the wrong sign. Moreover, the coefficients on GDP per capita remain highly significant. In columns 5 and 6 we included the Time to import and export which are respectively the mean times from port of discharge to arrival at the consignee and from shipment point to port of loading. Both these variables have the correct sign and the latter is significant. These measures do not only reflect the infrastructural efficiency of a port, but also the efficiency and speed with which authorities handle imports and exports.

Table 12: Effect of different infrastructure measures on long run pass through

	(1) LRPT	(2) LRPT	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT
GDP PC	-0.0000098***	-0.0000074***	-0.0000075***	-0.0000074**	-0.0000085***	-0.0000087***
	(0.0000024)	(0.0000025)	(0.0000022)	(0.0000031)	(0.0000021)	(0.0000020)
GDP PC Squared	1.2e-10**	9.1e-11	8.5e-11*	8.4e-11	1.0e-10**	9.5e-11**
	(5.2e-11)	(6.4e-11)	(4.7e-11)	(5.9e-11)	(4.8e-11)	(4.7e-11)
ln(Port Infra)	0.062					
	(0.048)					
ln(Ship Connectiv)		-0.0070				
		(0.0091)				
ln(Perc Paved Roads)			-0.013			
			(0.015)			
ln(Logistic Perf)				-0.038		
				(0.097)		
ln(Time Import)					-0.037	
					(0.025)	
ln(Time Export)						-0.051**
						(0.019)
Constant	0.18***	0.27***	0.31***	0.30***	0.29***	0.33***
	(0.064)	(0.028)	(0.053)	(0.094)	(0.034)	(0.033)
Observations	128	115	142	132	117	117
R^2	0.32	0.32	0.34	0.33	0.31	0.34
Adjusted R^2	0.30	0.30	0.32	0.31	0.29	0.33
BIC	-241.97	-232.06	-271.88	-245.48	-223.34	-228.90

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This brings us to table 13 displaying the effects of different broad based trade policy measures. Export costs, Import days, Export days, Custom burden and Time to clear customs have the correct sign and the first four are also highly significant. Export docs and Import docs are not significant. So, policy related trade costs seem to be more important for the pass through than infrastructure related trade costs. This also follows from the results in Table 5 in the main text showing that Port infrastructure is not significant, whereas Import costs is significant.

Table 13: Effect of different broad trade policy measures on long run pass through

	(1) LRPT	(2) LRPT	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT	(7) LRPT
GDP PC	-0.0000095***	-0.000010***	-0.000012***	-0.0000075***	-0.0000092***	-0.0000098***	-0.000014**
	(0.0000019)	(0.0000021)	(0.0000021)	(0.0000024)	(0.0000022)	(0.0000023)	(0.0000058)
GDP PC Squared	1.3e-10***	1.2e-10***	1.3e-10***	8.3e-11	1.1e-10**	1.2e-10**	3.6e-10
	(4.5e-11)	(4.4e-11)	(4.4e-11)	(5.2e-11)	(4.8e-11)	(5.0e-11)	(2.4e-10)
ln(Export Costs)	-0.058***						
	(0.022)						
ln(Export Days)		-0.043**					
		(0.021)					
ln(Import Days)			-0.062***				
			(0.019)				
ln(Export Docs)				0.019			
				(0.040)			
ln(Import Docs)					-0.029		
					(0.037)		
ln(Custom Burden)						-0.10*	
						(0.060)	
ln(Time Customs)							-0.015
							(0.021)
Constant	0.66***	0.39***	0.46***	0.22***	0.32***	0.12	0.30***
	(0.16)	(0.066)	(0.063)	(0.078)	(0.078)	(0.082)	(0.039)
Observations	146	146	146	146	146	128	110
R^2	0.36	0.35	0.37	0.33	0.33	0.33	0.13
Adjusted R^2	0.34	0.33	0.36	0.31	0.32	0.31	0.10
BIC	-285.82	-283.28	-289.52	-279.17	-279.54	-243.25	-148.32

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Tables 14 and 15 show the effects of different NRA measures on the pass through. Tables 14 and 15 show that only one NRA measure, NRA_agtrad_decpay, the NRA including non product specific measures and decoupled payments only for the tradables agricultural products, significantly decreases the long run pass through, but only at the 10% level.

Table 14: Effect of covered NRA measures on long run pass through

	(1) LRPT	(2) LRPT	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT	(7) LRPT
GDP PC	-1.1e-05***	-1.1e-05***	-1.1e-05***	-1.0e-05***	-1.1e-05***	-1.0e-05***	-1.2e-05***
	(2.9e-06)	(2.9e-06)	(3.0e-06)	(2.9e-06)	(3.0e-06)	(2.9e-06)	(3.0e-06)
GDP PC Squared	1.6e-10**	1.6e-10**	1.8e-10**	1.4e-10*	1.6e-10**	1.4e-10*	1.9e-10**
	(7.4e-11)	(7.3e-11)	(7.8e-11)	(7.3e-11)	(7.7e-11)	(7.3e-11)	(7.9e-11)
ln(NRA_covt)	-.043						
	(.03)						
ln(NRA_cov_bms)		-.048					
		(.031)					
ln(NRA_bms_covx)			-.045				
			(.031)				
ln(NRA_bms_covm)				-.03			
				(.029)			
ln(NRA_cov_dms)					-.13		
					(.29)		
ln(NRA_covm)						-.027	
						(.027)	
ln(NRA_covx)							-.04
							(.026)
Constant	.28***	.28***	.28***	.28***	.28***	.28***	.28***
	(.024)	(.024)	(.024)	(.026)	(.024)	(.026)	(.024)
Observations	75	75	73	68	75	68	73
R^2	0.41	0.41	0.40	0.42	0.39	0.42	0.40
Adjusted R^2	0.38	0.38	0.38	0.39	0.36	0.39	0.38
BIC	-156.93	-157.20	-151.19	-149.75	-154.99	-149.64	-151.41

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 15: Effect of total NRA measures on long run pass through

	(1) LRPT	(2) LRPT	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT	(7) LRPT
GDP PC	-1.0e-05***	-1.0e-05***	-1.0e-05***	-1.0e-05***	-1.1e-05***	-1.0e-05***	-1.3e-05***
	(2.9e-06)	(2.9e-06)	(2.9e-06)	(2.8e-06)	(3.0e-06)	(2.9e-06)	(3.7e-06)
GDP PC Squared	1.5e-10**	1.6e-10**	1.5e-10**	1.5e-10**	1.7e-10**	1.6e-10**	2.1e-10**
	(7.3e-11)	(7.4e-11)	(7.4e-11)	(7.0e-11)	(7.8e-11)	(7.4e-11)	(8.6e-11)
ln(NRA_totd)	-.038						
	(.024)						
ln(NRA_tott)		-.051					
		(.034)					
ln(NRA_totp)			-.051				
			(.037)				
ln(NRA_totm)				-.046			
				(.029)			
ln(NRA_totx)					-.041		
					(.036)		
ln(NRA_agtrad)						-.051	
						(.032)	
ln(NRA_agtrad_decpay)							-.044*
							(.023)
Constant	.28***	.28***	.28***	.29***	.28***	.28***	.32***
	(.024)	(.025)	(.025)	(.024)	(.025)	(.024)	(.038)
Observations	74	74	74	72	73	74	41
R^2	0.41	0.41	0.40	0.44	0.39	0.41	0.51
Adjusted R^2	0.38	0.38	0.38	0.41	0.37	0.38	0.47
BIC	-155.79	-155.48	-155.06	-159.69	-150.34	-155.77	-106.70

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 16 displays how the long run pass through is affected by the four different TRI measures. The table shows that the TRI measure based upon MFN tariffs has the strongest impact, whereas the TRI measures based upon MFN tariff and non tariff barriers and based upon applied tariffs are also significant with the correct sign. The applied tariff and non tariff barriers TRI has the correct sign, but is not significant.

Table 16: Effect of TRI measures on long run pass through

	(1) LRPT	(2) LRPT	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT
GDP PC	-0.000011***	-0.0000047	-0.0000094**	-0.0000042	-0.000011***	-0.0000080**
	(0.0000037)	(0.0000034)	(0.0000039)	(0.0000035)	(0.0000039)	(0.0000039)
GDP PC Squared	1.5e-10	3.1e-12	1.2e-10	-8.5e-12	1.7e-10*	8.5e-11
	(9.6e-11)	(8.8e-11)	(1.0e-10)	(9.1e-11)	(9.9e-11)	(1.0e-10)
ln(TRI Tariff MFN)	-0.036***				-0.035***	
	(0.011)				(0.011)	
ln(TRI MFN)		-0.037**				
		(0.015)				
ln(TRI Tariff Applied)			-0.016*			
			(0.0086)			
ln(TRI Applied)				-0.011		
				(0.010)		
ln(Import Cost)					-0.011	-0.024
					(0.023)	(0.024)
Constant	0.18***	0.19***	0.21***	0.22***	0.26	0.43**
	(0.029)	(0.029)	(0.029)	(0.029)	(0.17)	(0.17)
Observations	86	87	86	87	86	86
R^2	0.47	0.43	0.43	0.39	0.47	0.41
Adjusted R^2	0.45	0.41	0.41	0.37	0.45	0.39
BIC	-168.10	-166.25	-161.52	-160.89	-163.89	-158.94

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The next table, Table 17, exposes the effect of IDR measures calculated using GTAP data besides the IDR based upon FAO data. The results in columns 3 to 5 show that the GTAP IDR measures are not significant, except for IDR GTAP Proc, the IDR on processed food. In column 1 we replicate the result also displayed in the main analysis and in column 2 we repeat this analysis without dropping the re-exporters of food, defined as those countries that export more food than they produce. The coefficient

falls by half, but IDR still has a significant positive impact on the long run pass through.

Table 17: Effect of IDR measures on long run pass through

	(1) LRPT	(2) LRPT	(3) LRPT	(4) LRPT	(5) LRPT
GDP PC	-0.000013***	-0.000011***	-0.0000088***	-0.0000079***	-0.0000090***
	(0.0000037)	(0.0000025)	(0.0000022)	(0.0000023)	(0.0000022)
GDP PC Squared	1.6e-10*	1.5e-10***	1.1e-10**	8.7e-11	1.1e-10**
	(9.7e-11)	(5.3e-11)	(5.1e-11)	(5.3e-11)	(5.1e-11)
ln(IDR FAO All)	0.050**	0.025**			
	(0.020)	(0.011)			
ln(IDR GTAP All)			0.018		
			(0.013)		
ln(IDR GTAP Prim)				-0.0059	
				(0.010)	
ln(IDR GTAP Proc)					0.026*
					(0.013)
Constant	0.35***	0.30***	0.30***	0.25***	0.31***
	(0.042)	(0.028)	(0.032)	(0.032)	(0.031)
Observations	91	100	107	107	107
R^2	0.36	0.34	0.33	0.32	0.34
Adjusted R^2	0.34	0.32	0.31	0.30	0.32
BIC	-151.47	-184.49	-202.69	-201.07	-204.70

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In table 18 we analyse the effect of being landlocked and the Sachs and Warner openness index. Column 1 displays the results of regressing the log of the long run pass through on GDP per capita and a landlocked dummy. The dummy is not significant and has the wrong sign. Landlocked countries would display a higher degree of pass through. Dropping Switzerland from the sample in column 2, an influential datapoint, shows that landlocked falls in sign and stays insignificant. Column 3 shows that the Sachs and Warner index has the wrong sign and is insignificant controlling for GDP per capita.

Tables 20 and 19 display the effects of adding the different continent dummies to the baseline regression with GDP per capita as regressor. Only the African dummy is significant. We also tested whether the pass through is significantly lower in the EU, reflecting an influence of the CAP as claimed in Ferrucci et al. (2012). The EU dummy is not significant, but this might reflect that also many other countries

Table 18: Effect of Landlocked and Sachs Warner index on long run pass through

	(1) LRPT	(2) LRPT	(3) LRPT
GDP PC	-0.0000081***	-0.0000077***	-0.0000078***
	(0.0000020)	(0.0000020)	(0.0000020)
GDP PC Squared	9.3e-11*	8.5e-11*	9.3e-11**
	(4.8e-11)	(4.8e-11)	(4.7e-11)
Landlocked	0.0040	0.019	
	(0.025)	(0.026)	
Sachs Warner index			-0.019
			(0.036)
Constant	0.26***	0.26***	0.27***
	(0.017)	(0.017)	(0.032)
Observations	147	146	121
R^2	0.33	0.32	0.34
Adjusted R^2	0.31	0.30	0.32
BIC	-281.09	-278.32	-239.10

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

take policy measures similar to CAP-EU measures, which reduce integration into the world food market and thus the pass through. Including all continent dummies together, displayed in column 7 of Table 19, leads only to insignificant continent dummies whereas the effect of GDP per capita and GDP per capita squared stays significant.

Tables 21 and 22 present the results of the same analysis as in the main text with the exchange rate pass-throughs instead of the world food price pass through. Table 21 shows that GDP per capita has a strong negative and highly significant impact on the exchange rate pass through. The elasticity of the pass through with respect to GDP per capita is much lower than with respect to the world food price index, 0.071 instead of 0.28 (column 2). The nonlinear specification generates a positive and significant quadratic term and a negative and significant linear term, as with the world food price pass through. The dummies for Africa and Asia are not significant in contrast to the analysis with the world food price pass through. Table 22 shows somewhat surprisingly that of the market integration measures only the NRA is significantly associated with the exchange rate pass through with the expected negative sign. We should not attach too much value to these estimation results, as they are likely to be influenced by

Table 19: Effect of Continent dummies on long run pass through

	(1) LRPT	(2) LRPT	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT	(7) LRPT
GDP PC	-1.0e-05***	-8.3e-06***	-8.3e-06***	-8.5e-06***	-8.3e-06***	-8.5e-06***	-8.3e-06***
	(2.0e-06)	(1.8e-06)	(1.9e-06)	(1.9e-06)	(1.8e-06)	(1.8e-06)	(1.8e-06)
GDP PC Squared	1.3e-10***	1.0e-10**	9.7e-11**	1.0e-10**	9.6e-11**	1.0e-10**	9.7e-11**
	(4.5e-11)	(4.3e-11)	(4.4e-11)	(4.5e-11)	(4.4e-11)	(4.4e-11)	(4.4e-11)
Africa	-.073**						
	(.03)						
Asia		.029					
		(.02)					
Europe			.0011				
			(.016)				
EU				.01			
				(.016)			
North America					.0052		
					(.017)		
South America						-.035	
						(.042)	
Oceania							.02
							(.06)
Constant	.29***	.25***	.26***	.26***	.26***	.26***	.26***
	(.019)	(.017)	(.016)	(.016)	(.016)	(.017)	(.016)
Observations	147	147	147	147	147	147	147
R^2	0.35	0.34	0.33	0.33	0.33	0.33	0.33
Adjusted R^2	0.34	0.32	0.31	0.31	0.31	0.32	0.31
BIC	-287.18	-283.22	-281.07	-281.48	-281.16	-281.77	-281.18

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 20: Effect of Continent dummies on long run pass through

	(1) LRPT	(2) LRPT	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT	(7) LRPT
GDP PC	-1.0e-05***	-1.0e-05***	-1.0e-05***	-1.1e-05***	-1.0e-05***	-1.0e-05***	-1.1e-05***
	(2.0e-06)	(2.0e-06)	(2.0e-06)	(2.0e-06)	(2.0e-06)	(2.0e-06)	(2.1e-06)
GDP PC Squared	1.3e-10***	1.3e-10***	1.3e-10***	1.4e-10***	1.3e-10***	1.3e-10***	1.4e-10***
	(4.5e-11)	(4.5e-11)	(4.6e-11)	(4.6e-11)	(4.6e-11)	(4.5e-11)	(4.6e-11)
Africa	-.073**	-.067**	-.074**	-.082***	-.073**	-.073**	-.084
	(.03)	(.03)	(.03)	(.03)	(.03)	(.03)	(.065)
Asia		.02					.0069
		(.02)					(.061)
Europe			-.0043				-.0094
			(.016)				(.06)
South America				-.059			-.062
				(.042)			(.071)
North America					-3.1e-05		-.0075
					(.017)		(.061)
Oceania						.0088	
						(.059)	
Constant	.29***	.28***	.29***	.3***	.29***	.29***	.3***
	(.019)	(.02)	(.019)	(.02)	(.02)	(.019)	(.06)
Observations	147	147	147	147	147	147	147
R^2	0.35	0.36	0.35	0.36	0.35	0.35	0.37
Adjusted R^2	0.34	0.34	0.34	0.35	0.34	0.34	0.33
BIC	-287.18	-283.16	-282.27	-284.20	-282.19	-282.22	-269.84

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

countries with fixed exchange rate regimes. In periods of exchange rate realignments for these countries, a spurious effect on local food prices might appear.

Table 21: Effect of GDP per capita and continent dummies on long run exchange rate pass through

	(1) LRPT	(2) LRPT	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT
GDP PC	-6.7e-06***		1.5e-06	-1.7e-05***	1.5e-06	1.5e-06
	(1.2e-06)		(1.7e-06)	(3.5e-06)	(1.7e-06)	(1.7e-06)
ln(GDP PC)		-.071***				
		(.01)				
Poor			.38***		.35***	.38***
			(.058)		(.067)	(.058)
Middle			.22***		.21***	.22***
			(.043)		(.045)	(.043)
GDP PC Squared				2.7e-10***		
				(8.7e-11)		
Africa					.032	
					(.044)	
Asia						-.013
						(.045)
Constant	.29***	.82***	.055	.34***	.054	.056
	(.023)	(.09)	(.043)	(.027)	(.043)	(.043)
Observations	133	133	133	133	133	133
R^2	0.20	0.28	0.41	0.26	0.41	0.41
Adjusted R^2	0.20	0.27	0.39	0.24	0.39	0.39
BIC	-81.56	-94.53	-111.33	-91.02	-107.00	-106.52

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Tables 23 and 24 display the effects of the different OECD product market regulation (PMR) measures on the long run pass through, controlling for income levels. We use the indicators on sectoral regulation in retail trade. The tables show that only the variables upper and lower price controls are significant (at the 5% level) with the expected sign. So countries with price controls in place display a lower degree of food price pass through, as would be expected. We should take into account that the sample is restricted 40 countries or less. Nevertheless GDP per capita is highly significant and has the correct sign in all regressions.

Table 22: Effect of market integration on long run exchange rate pass through

	(1) LRPT	(2) LRPT	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT	(7) lrptwfpi
GDP PC	-0.000013***	-0.000015***	-0.000021***	-0.0000034	-0.000012***	-0.00000022	-0.000013***
	(0.0000045)	(0.0000038)	(0.0000054)	(0.0000065)	(0.0000043)	(0.0000089)	(0.0000045)
GDP PC Squared	2.0e-10**	2.2e-10**	5.4e-10***	-6.8e-11	1.8e-10*	-1.2e-10	2.1e-10*
	(9.9e-11)	(9.1e-11)	(1.6e-10)	(1.8e-10)	(9.5e-11)	(2.3e-10)	(1.2e-10)
ln(Port Infra)	-0.13					0.14	
	(0.081)					(0.14)	
ln(Import Cost)		0.072				0.051	-0.039
		(0.044)				(0.066)	(0.033)
NRA			-0.13**				
			(0.057)				
ln(TRI)				-0.026		-0.059	-0.034
				(0.030)		(0.043)	(0.021)
ln(IDR)					-0.030*	-0.052*	
					(0.017)	(0.031)	
Constant	0.50***	-0.19	0.34***	0.25***	0.26***	-0.48	0.47*
	(0.11)	(0.32)	(0.040)	(0.068)	(0.047)	(0.54)	(0.26)
Observations	119	132	73	78	94	52	78
R^2	0.27	0.27	0.27	0.23	0.28	0.35	0.35
Adjusted R^2	0.25	0.25	0.24	0.20	0.26	0.26	0.32
BIC	-80.18	-88.14	-73.04	-61.66	-87.39	-35.65	-116.11

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 23: Effect of OECD product market integration measures in long run pass through

	(1)	(2)	(3)	(4)	(5)
	lrptwfpi	lrptwfpi	lrptwfpi	lrptwfpi	lrptwfpi
GDP PC	-1.0e-05***	-1.0e-05***	-1.0e-05**	-9.4e-06***	-1.0e-05***
	(3.5e-06)	(3.5e-06)	(3.8e-06)	(3.0e-06)	(3.3e-06)
GDP PC Squared	1.4e-10**	1.3e-10*	1.4e-10*	1.1e-10*	1.4e-10**
	(6.8e-11)	(6.9e-11)	(7.6e-11)	(6.0e-11)	(6.4e-11)
Summary PMR	-.0064				
	(.011)				
Barriers to Entry		.005			
		(.009)			
Reg. Comm. Register			.00023		
			(.0063)		
Lic. Comm. Activity				.0075	
				(.005)	
Reg. Large Outlets					-.0021
					(.0052)
Constant	.29***	.26***	.27***	.24***	.28***
	(.051)	(.05)	(.049)	(.039)	(.04)
Observations	36	36	36	39	37
R^2	0.37	0.37	0.36	0.43	0.40
Adjusted R^2	0.31	0.31	0.30	0.38	0.34
BIC	-96.56	-96.54	-96.20	-107.63	-99.83

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 24: Effect of OECD product market integration measures in long run pass through

	(1)	(2)	(3)	(4)	(5)
	lrptwfpi	lrptwfpi	lrptwfpi	lrptwfpi	lrptwfpi
GDP PC	-1.0e-05***	-9.7e-06***	-9.4e-06***	-1.2e-05***	-1.2e-05***
	(3.6e-06)	(3.6e-06)	(3.1e-06)	(3.2e-06)	(2.9e-06)
GDP PC Squared	1.3e-10*	1.3e-10*	1.2e-10*	1.8e-10***	1.7e-10***
	(6.8e-11)	(6.9e-11)	(6.1e-11)	(6.2e-11)	(5.7e-11)
Operat. Restrictions	-.0023				
	(.0077)				
Prot. Existing Firms		-.00023			
		(.0063)			
Opening Hours Shops			-.0029		
			(.0036)		
Upper Price Controls				-.023**	
				(.0085)	
Lower Price Controls					-.02***
					(.007)
Constant	.28***	.27***	.27***	.34***	.32***
	(.045)	(.037)	(.037)	(.046)	(.039)
Observations	36	39	39	36	39
R^2	0.36	0.39	0.40	0.48	0.50
Adjusted R^2	0.30	0.34	0.35	0.43	0.46
BIC	-96.30	-105.21	-105.91	-103.74	-113.07

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix D Robustness Checks

In this section we present the full results from five sets of robustness checks discussed briefly in the main text.

First, we estimated vector error correction (VEC) models of cointegration as a robustness check. Several authors (Baffes and Gardner, 2003; Conforti, 2004; Gilbert, 2010; Minot, 2010; Cudjoe, et al., 2010) explore food price pass through using VEC models. There are three important reasons why a cointegration analysis is not appropriate for our data. First, there are good reasons to believe that world food prices and local food prices are not comoving. In many countries food markets are poorly integrated into world markets as a result of natural and policy-driven trade barriers and local prices do not respond to changes in world prices. Second, there is an important local cost component in the food prices analysed, making it less likely that the world food prices index and local food price indices are cointegrated. Third, Engle Granger tests of the stationarity of the residuals of a regression of local food prices on world food prices and exchange rates show that in only four countries we can reject the null of no stationarity: Burundi, Congo, Japan and Moldova. If we perform a Johansen test for these countries, we only find a cointegration relationship in Japan and Moldova.

As robustness check, we performed Johansen tests of cointegration for all countries, finding a cointegration relationship in 42 countries. Although we are doubtful about the presence of a cointegrating relationship because of theoretical reasons and because of the results of the Engle Granger tests, we decided to estimate VEC models for the 42 countries, as a robustness check. We estimated a VEC model with the world food price index in local currencies (so the world food price multiplied by the exchange rate) and the local food price index as variables using 5 lags.[33][34] We saved the cointegration coefficient and its standard error for each country as the long run pass through.[35]

In tables 25 and 26 we then analysed the results and estimated the same weighted least squares models as in the main analysis with the cointegration coefficients as long run pass-throughs. The first two columns show that GDP per capita also has a strongly significant negative impact on the long run pass through following from the cointegration analysis. The elasticity of 0.25 in column 2 is remarkably

close to the elasticity of 0.28 in the main analysis. The remaining columns show that the GDP per capita is not significant in the non-linear specification and that the continent dummies also become insignificant. This is probably due to the fact that are sample has become small and is selective.

Table 25: Effect of GDP per capita and continent dummies on long run pass through from cointegration analysis

	(1) LRPT	(2) ln(LRPT)	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT
GDP PC	-1.3e-05***			-8.4e-06	-1.1e-05	-1.9e-05***
	(1.5e-06)			(7.7e-06)	(8.2e-06)	(5.1e-06)
ln(GDP PC)		-.25***				
		(.053)				
Poor			.41***			-.17
			(.082)			(.17)
Middle			.33***			-.2
			(.058)			(.15)
GDP PC Squared				-1.2e-10	-6.4e-11	
				(2.1e-10)	(2.2e-10)	
Africa					-.083	
					(.089)	
Asia						.028
						(.056)
Constant	.74***	1.4***	.35***	.73***	.75***	.93***
	(.036)	(.49)	(.036)	(.042)	(.049)	(.16)
Observations	42	42	42	42	42	42
R^2	0.64	0.35	0.54	0.64	0.65	0.66
Adjusted R^2	0.63	0.33	0.51	0.63	0.62	0.62
BIC	-35.64	79.83	-21.17	-35.99	-33.22	-26.74

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 26 analyses the impact of the different measures of market integration. None of these measures has a significant effect on the cointegration pass through. GDP per capita, however, stays strongly significant in all specifications.

Second, we addressed endogeneity of exchange rates to local food prices. Thereto, we estimated a trivariate VAR for each country with world food prices, local food prices, and exchange rates as included variables. We first determined the number of lags with the Akaike information criterion (AIC) and then

Table 26: Effect of market integration on long run pass through from cointegration analysis

	(1) LRPT	(2) LRPT	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT	(7) LRPT
GDP PC	-0.000013***	-0.000013***	-0.000017***	-0.000013***	-0.000015***	-0.000018***	0.0000079
	(0.0000023)	(0.0000015)	(0.0000025)	(0.0000017)	(0.0000022)	(0.0000036)	(0.000011)
ln(Port Infra)	-0.0081					0.35	
	(0.15)					(0.31)	
ln(Import Cost)		0.0090				0.072	0.068
		(0.059)				(0.10)	(0.063)
NRA			-0.017				
			(0.061)				
ln(TRI)				-0.070		-0.076	-0.069
				(0.042)		(0.067)	(0.041)
ln(IDR)					0.022	-0.0053	
					(0.029)	(0.065)	
GDP PC Squared							-5.7e-10*
							(3.1e-10)
Constant	0.76***	0.68	0.86***	0.56***	0.80***	-0.44	0.037
	(0.21)	(0.41)	(0.067)	(0.10)	(0.064)	(0.88)	(0.47)
Observations	36	42	19	26	31	19	26
R^2	0.65	0.64	0.77	0.72	0.66	0.74	0.77
Adjusted R^2	0.62	0.62	0.74	0.70	0.63	0.64	0.72
BIC	-25.64	-31.93	-18.35	-24.64	-19.30	-4.58	-26.18

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

ran Granger causality tests for the significance of local food prices and the joint significance of local and world food prices in the equation explaining the exchange rate. We isolated all countries for which we failed to reject at the 10% level that local food prices have an effect on (Granger cause) the exchange rate, either directly or indirectly through world food prices. We subsequently re-estimated the second step regressions explaining the long run pass through, dropping these countries. Based on our test, 57 out of the 147 countries had to be dropped. The results are in Tables 27 and 28. With the limited sample of countries, all our results on the effect of income per capita, continents, and market integration carry through. The results on some variables become more significant. In particular, NRA displays a significant negative coefficient, as expected.

Table 27: Effect of GDP per capita and continent dummies on long run pass through with lagged dependent variables in the pass through regression and dropping the observations with endogeneity of the exchange rate with respect to local food prices

	(1) LRPT	(2) ln(LRPT)	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT
GDP PC	-4.3e-06***		-8.4e-06***	-1.9e-06*	-9.9e-06***	-1.9e-06**
	(5.8e-07)		(2.1e-06)	(9.7e-07)	(2.2e-06)	(9.5e-07)
ln(GDP PC)		-.31***				
		(.048)				
GDP PC Squared			1.0e-10**		1.2e-10**	
			(4.8e-11)		(4.9e-11)	
Poor				.089*		.14**
				(.049)		(.055)
Middle				.09***		.1***
				(.03)		(.03)
Africa					-.058*	-.073**
					(.034)	(.036)
Constant	.24***	.86*	.26***	.16***	.28***	.16***
	(.015)	(.45)	(.018)	(.029)	(.021)	(.028)
Observations	90	86	90	90	90	90
R^2	0.38	0.34	0.41	0.44	0.43	0.47
Adjusted R^2	0.37	0.33	0.40	0.42	0.41	0.44
BIC	-195.73	149.79	-200.16	-195.94	-198.71	-195.71

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

As a third robustness check, we addressed possible endogeneity of world food prices in three ways.

Table 28: Effect of market integration on long run pass through with lagged dependent variables in the pass through regression and dropping the observations with endogeneity of the exchange rate with respect to local food prices

	(1) LRPT	(2) LRPT	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT	(7) LRPT
GDP PC	-0.000010***	-0.0000093***	-0.0000096***	-0.0000094	-0.000014***	-0.000025*	-0.0000099
	(0.0000030)	(0.0000021)	(0.0000031)	(0.0000071)	(0.0000031)	(0.000015)	(0.0000074)
GDP PC Squared	1.3e-10**	1.2e-10**	1.4e-10*	1.1e-10	1.9e-10***	4.9e-10	1.2e-10
	(6.1e-11)	(4.9e-11)	(7.8e-11)	(1.8e-10)	(6.2e-11)	(3.7e-10)	(1.9e-10)
ln(Port Infra)	0.069					0.097	
	(0.065)					(0.10)	
ln(Import Cost)		-0.045*				0.041	-0.011
		(0.026)				(0.057)	(0.036)
NRA			-0.046**				
			(0.022)				
ln(TRI)				-0.034**		-0.042	-0.034**
				(0.014)		(0.025)	(0.014)
ln(IDR)					0.033**	0.023	
					(0.014)	(0.030)	
Constant	0.17*	0.58***	0.27***	0.19***	0.32***	-0.19	0.26
	(0.086)	(0.19)	(0.025)	(0.034)	(0.033)	(0.46)	(0.26)
Observations	79	90	43	50	59	32	50
R^2	0.40	0.43	0.55	0.58	0.44	0.57	0.58
Adjusted R^2	0.38	0.41	0.51	0.55	0.41	0.46	0.54
BIC	-169.84	-198.70	-109.87	-110.20	-117.70	-47.47	-106.38

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

First, we examined robustness of the results to exclusion of the 12 biggest food exporters. This reflects the concern that the world food price could be endogenous to local food prices in big food exporters. Table 29 shows that the impact of GDP per capita becomes somewhat smaller relative to the baseline. The elasticity in column 2 drops to 0.25. The 12 biggest food exporters dropped from the sample are USA, France, Nethelands, Belgium, Canada, Spain, Italy, Australia, China, Brazil and Argentina. So, except for the last three countries these are rich countries. One would expect that endogeneity of world food prices leads to an upward bias in the long run pass through of the rich countries. Since most of the big food exporters are rich countries this should then lead to a weaker relation between GDP per capita and pass through. Instead, we find that the relation is stronger when keeping the big food exporters. So, with respect to the coefficient on GDP per capita this type of endogeneity does not seem to pose any problem.

Table 29: Effect of GDP per capita and continent dummies on long run pass through omitting 12 biggest food exporters

	(1) LRPT	(2) ln(LRPT)	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT
GDP PC	-4.2e-06***		-5.1e-06**	-2.9e-06**	-3.0e-06***	-7.3e-06***
	(6.4e-07)		(2.1e-06)	(1.1e-06)	(1.1e-06)	(2.2e-06)
ln(GDP PC)		-.25***				
		(.039)				
GDP PC Squared			2.1e-11			5.8e-11
			(4.9e-11)			(5.1e-11)
Poor				.06	.13***	
				(.042)	(.046)	
Middle				.038	.054*	
				(.032)	(.031)	
Africa					-.1***	-.071**
					(.031)	(.029)
Constant	.25***	.38	.25***	.21***	.21***	.28***
	(.013)	(.35)	(.016)	(.032)	(.031)	(.019)
Observations	136	129	136	136	136	136
R^2	0.25	0.25	0.25	0.26	0.31	0.28
Adjusted R^2	0.24	0.24	0.24	0.24	0.29	0.26
BIC	-222.08	261.87	-222.26	-214.42	-219.70	-223.26

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 30: Effect of market integration on long run pass through omitting 12 biggest food exporters

	(1) LRPT	(2) LRPT	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT	(7) LRPT
GDP PC	-0.0000057*	-0.0000066***	-0.0000040	-0.0000084	-0.0000079***	-0.000015	-0.0000086
	(0.0000029)	(0.0000023)	(0.0000040)	(0.0000050)	(0.0000030)	(0.0000095)	(0.0000054)
GDP PC Squared	2.8e-11	5.3e-11	3.9e-11	8.1e-11	6.9e-11	2.5e-10	8.6e-11
	(6.1e-11)	(5.4e-11)	(1.3e-10)	(1.4e-10)	(6.3e-11)	(2.4e-10)	(1.5e-10)
ln(Port Infra)	0.043					-0.021	
	(0.058)					(0.090)	
ln(Import Cost)		-0.032				0.0061	-0.0037
		(0.022)				(0.039)	(0.028)
NRA			-0.081*				
			(0.042)				
ln(TRI)				-0.030*		-0.031	-0.030*
				(0.015)		(0.020)	(0.016)
ln(IDR)					0.027*	0.021	
					(0.014)	(0.024)	
Constant	0.19**	0.49***	0.27***	0.19***	0.30***	0.21	0.21
	(0.077)	(0.16)	(0.026)	(0.035)	(0.031)	(0.33)	(0.21)
Observations	117	135	63	81	90	53	81
R^2	0.24	0.26	0.38	0.38	0.30	0.42	0.38
Adjusted R^2	0.22	0.24	0.35	0.36	0.28	0.34	0.35
BIC	-180.44	-217.56	-103.21	-122.08	-146.37	-69.55	-117.70

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In Table 30 we explored the impact of market integration in the sample without the 12 biggest food exporters. Relative to the main analysis, all results on the market integration measures stay the same, except for the effect of import costs which becomes insignificant.

Table 31: Effect of GDP per capita and continent dummies on long run pass through omitting the contemporary lag in pass through regression

	(1) LRPT	(2) ln(LRPT)	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT
GDP PC	-4.0e-06***		-7.6e-06***	-1.7e-06*	-1.8e-06*	-9.1e-06***
	(5.3e-07)		(1.8e-06)	(9.4e-07)	(9.2e-07)	(1.9e-06)
ln(GDP PC)		-.24***				
		(.034)				
GDP PC Squared			9.0e-11**			1.2e-10***
			(4.2e-11)			(4.4e-11)
Poor				.097**	.15***	
				(.038)	(.042)	
Middle				.074***	.085***	
				(.027)	(.027)	
Africa					-.074**	-.053*
					(.031)	(.029)
Constant	.23***	.18	.25***	.16***	.16***	.27***
	(.013)	(.32)	(.015)	(.027)	(.026)	(.019)
Observations	147	141	147	147	147	147
R^2	0.28	0.26	0.30	0.32	0.34	0.31
Adjusted R^2	0.27	0.26	0.29	0.30	0.32	0.30
BIC	-290.94	234.90	-295.65	-289.64	-290.43	-294.14

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Second, we addressed the potential problem of endogeneity by omitting contemporary world food prices and exchange rates from the regression. Table 31 shows that all conclusions from the main analysis remain intact: GDP per capita remains strongly significant; the elasticity of the pass through with respect to GDP per capita falls somewhat from 0.28 to 0.24; the quadratic specification generates still highly significant coefficients of the same sign; and the African dummy remains negative and significant. The results in table 32 imply that the market integration variables also keep the same coefficient signs.

A third way to address the problem of endogeneity estimated a trivariate VAR with world food prices, local food prices, and exchange rates as included variables as described in the previous point. Similar

Table 32: Effect of market integration on long run pass through omitting the contemporary lag in pass through regression

	(1) LRPT	(2) LRPT	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT	(7) LRPT
GDP PC	-0.0000092***	-0.0000086***	-0.0000092***	-0.0000093**	-0.000011***	-0.000014**	-0.0000092**
	(0.0000023)	(0.0000018)	(0.0000028)	(0.0000036)	(0.0000024)	(0.0000064)	(0.0000038)
GDP PC Squared	1.2e-10**	1.1e-10***	1.4e-10*	1.3e-10	1.4e-10***	2.4e-10	1.2e-10
	(5.0e-11)	(4.3e-11)	(7.1e-11)	(9.3e-11)	(5.1e-11)	(1.6e-10)	(9.7e-11)
ln(Port Infra)	0.067					-0.0038	
	(0.046)					(0.080)	
ln(Import Cost)		-0.039**				0.019	0.0038
		(0.019)				(0.033)	(0.023)
NRA			-0.041*				
			(0.023)				
ln(TRI)				-0.033***		-0.027	-0.034***
				(0.011)		(0.018)	(0.011)
ln(IDR)					0.026**	0.027	
					(0.011)	(0.020)	
Constant	0.16**	0.53***	0.27***	0.17***	0.29***	0.10	0.14
	(0.062)	(0.14)	(0.024)	(0.029)	(0.027)	(0.29)	(0.17)
Observations	128	146	74	86	100	57	86
R^2	0.29	0.32	0.38	0.42	0.32	0.42	0.42
Adjusted R^2	0.28	0.30	0.35	0.40	0.30	0.35	0.39
BIC	-251.42	-292.68	-158.70	-170.99	-191.49	-87.21	-166.56

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

to the approach for endogeneity of the exchange rate we dropped the countries for which we failed to reject at the 10% level that local food prices have an effect on the exchange rate, either directly or indirectly through exhange rates. We then re-estimated the second-step regressions, dropping 51 of the 147 countries. The results are in Tables 33 and 34. With the limited sample we find almost identical results. Two results change: GDP per capita squared and the import dependency become insignificant.

Table 33: Effect of GDP per capita and continent dummies on long run pass through with lagged dependent variables in the pass through regression and dropping the observations with endogeneity of the world food price with respect to local food prices

	(1) LRPT	(2) ln(LRPT)	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT
GDP PC	-4.5e-06***		-6.9e-06**	-2.4e-06**	-2.6e-06**	-1.1e-05***
	(6.6e-07)		(2.6e-06)	(1.2e-06)	(1.2e-06)	(2.8e-06)
ln(GDP PC)		-.29***				
		(.047)				
GDP PC Squared			6.3e-11			1.4e-10*
			(6.9e-11)			(7.1e-11)
Poor				.06	.15***	
				(.048)	(.052)	
Middle				.072**	.091***	
				(.034)	(.033)	
Africa					-.12***	-.1***
					(.037)	(.034)
Constant	.24***	.67	.25***	.18***	.18***	.29***
	(.016)	(.44)	(.02)	(.034)	(.032)	(.024)
Observations	96	92	96	96	96	96
R^2	0.33	0.30	0.34	0.36	0.43	0.39
Adjusted R^2	0.32	0.29	0.32	0.34	0.40	0.37
BIC	-198.24	165.76	-199.11	-193.65	-199.74	-203.14

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Fourth, in tables 35 and 36 the results are displayed of the same analysis as in the main text, but with the long run pass-throughs based on estimation with 12 lags. Tables 37 and 38 show the results of the analyses with 18 lags. Tables 35 and 37 show that we also find a strongly significant negative effect of GDP per capita on the long run pass through for estimations with different lag lengths.[36] The nonlinear effects are also robust to variation in lag length, as well as the negative African dummy.

Table 34: Effect of market integration on long run pass through with lagged dependent variables in the pass through regression and dropping the observations with endogeneity of the world food price with respect to local food prices

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	LRPT	LRPT	LRPT	LRPT	LRPT	LRPT	LRPT
GDP PC	-0.0000075*	-0.0000091***	-0.0000079**	-0.000010	-0.000010**	-0.000021*	-0.000014**
	(0.0000039)	(0.0000027)	(0.0000031)	(0.0000069)	(0.0000044)	(0.000011)	(0.0000068)
GDP PC Squared	7.4e-11	1.2e-10*	1.1e-10	1.4e-10	1.2e-10	4.1e-10	2.4e-10
	(9.0e-11)	(7.0e-11)	(7.6e-11)	(1.8e-10)	(1.1e-10)	(2.7e-10)	(1.8e-10)
ln(Port Infra)	0.025					-0.068	
	(0.069)					(0.11)	
ln(Import Cost)		-0.067**				-0.081	-0.075**
		(0.026)				(0.053)	(0.034)
NRA			-0.047**				
			(0.022)				
ln(TRI)				-0.039***		-0.032	-0.038***
				(0.015)		(0.024)	(0.014)
ln(IDR)					0.022	0.024	
					(0.014)	(0.024)	
Constant	0.22**	0.73***	0.26***	0.17***	0.29***	0.92*	0.72***
	(0.090)	(0.19)	(0.028)	(0.036)	(0.039)	(0.46)	(0.25)
Observations	83	95	44	55	65	37	55
R^2	0.32	0.38	0.46	0.53	0.33	0.56	0.57
Adjusted R^2	0.30	0.36	0.42	0.50	0.30	0.47	0.54
BIC	-163.78	-199.06	-112.98	-111.68	-115.63	-49.12	-112.83

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 35: Effect of GDP per capita and continent dummies on long run pass through with 12 lags

	(1) LRPT	(2) ln(LRPT)	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT
GDP PC	-4.1e-06***		-2.0e-06**	-7.2e-06***	-2.0e-06**	-1.9e-06**
	(5.1e-07)		(9.1e-07)	(1.7e-06)	(8.9e-07)	(9.2e-07)
ln(GDP PC)		-.31***				
		(.046)				
Poor			.087**		.14***	.087**
			(.036)		(.039)	(.036)
Middle			.068**		.08***	.068**
			(.026)		(.026)	(.027)
GDP PC Squared				7.9e-11*		
				(4.1e-11)		
Africa					-.081***	
					(.029)	
Asia						.0068
						(.018)
Constant	.22***	.68	.15***	.23***	.15***	.15***
	(.012)	(.43)	(.026)	(.014)	(.025)	(.027)
Observations	147	141	147	147	147	147
R^2	0.31	0.25	0.34	0.33	0.38	0.34
Adjusted R^2	0.30	0.24	0.33	0.32	0.36	0.33
BIC	-302.85	327.80	-300.59	-306.57	-303.57	-295.74

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 36: Effect of market integration on long run pass through with 12 lags

	(1) LRPT	(2) LRPT	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT	(7) LRPT
GDP PC	-0.0000088***	-0.0000080***	-0.0000085***	-0.0000098***	-0.000010***	-0.000015**	-0.0000093**
	(0.0000022)	(0.0000018)	(0.0000027)	(0.0000036)	(0.0000023)	(0.0000065)	(0.0000038)
GDP PC Squared	1.0e-10**	9.9e-11**	1.1e-10	1.3e-10	1.2e-10**	2.5e-10	1.2e-10
	(4.8e-11)	(4.2e-11)	(6.9e-11)	(9.4e-11)	(4.9e-11)	(1.7e-10)	(9.8e-11)
ln(Port Infra)	0.068					-0.024	
	(0.044)					(0.080)	
ln(Import Cost)		-0.032*				0.036	0.012
		(0.018)				(0.033)	(0.023)
NRA			-0.033				
			(0.022)				
ln(TRI)				-0.030***		-0.028	-0.031***
				(0.011)		(0.018)	(0.011)
ln(IDR)					0.026**	0.028	
					(0.010)	(0.020)	
Constant	0.14**	0.46***	0.25***	0.17***	0.28***	0.0090	0.078
	(0.059)	(0.13)	(0.022)	(0.028)	(0.026)	(0.30)	(0.17)
Observations	128	146	74	86	100	57	86
R^2	0.33	0.34	0.41	0.45	0.35	0.43	0.45
Adjusted R^2	0.31	0.33	0.38	0.43	0.33	0.36	0.42
BIC	-263.56	-302.53	-163.84	-172.56	-199.13	-85.57	-168.42

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 37: Effect of GDP per capita and continent dummies on long run pass through with 18 lags

	(1) LRPT	(2) ln(LRPT)	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT
GDP PC	-5.1e-06***		-2.4e-06**	-1.0e-05***	-2.5e-06**	-2.3e-06**
	(6.4e-07)		(1.1e-06)	(2.1e-06)	(1.1e-06)	(1.1e-06)
ln(GDP PC)		-.28***				
		(.048)				
Poor			.11**		.18***	.11**
			(.046)		(.051)	(.046)
Middle			.089***		.11***	.09***
			(.033)		(.033)	(.033)
GDP PC Squared				1.2e-10**		
				(5.1e-11)		
Africa					-.11***	
					(.037)	
Asia						.021
						(.024)
Constant	.27***	.53	.19***	.29***	.19***	.18***
	(.015)	(.45)	(.032)	(.019)	(.031)	(.033)
Observations	147	141	147	147	147	147
R^2	0.31	0.19	0.34	0.33	0.38	0.35
Adjusted R^2	0.30	0.19	0.33	0.32	0.36	0.33
BIC	-236.05	330.59	-234.39	-242.02	-237.71	-230.22

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 38: Effect of market integration on long run pass through with 18 lags

	(1) LRPT	(2) LRPT	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT	(7) LRPT
GDP PC	-0.000012***	-0.000011***	-0.000012***	-0.000015***	-0.000014***	-0.000020**	-0.000015***
	(0.0000028)	(0.0000022)	(0.0000034)	(0.0000045)	(0.0000028)	(0.0000078)	(0.0000047)
GDP PC Squared	1.5e-10**	1.6e-10***	2.0e-10**	2.4e-10**	1.8e-10***	3.4e-10*	2.4e-10*
	(5.9e-11)	(5.2e-11)	(8.6e-11)	(1.2e-10)	(6.1e-11)	(2.0e-10)	(1.2e-10)
ln(Port Infra)	0.068					-0.029	
	(0.054)					(0.097)	
ln(Import Cost)		-0.053**				0.014	0.0014
		(0.023)				(0.041)	(0.028)
NRA			-0.050*				
			(0.028)				
ln(TRI)				-0.043***		-0.028	-0.043***
				(0.014)		(0.022)	(0.014)
ln(IDR)					0.026**	0.034	
					(0.013)	(0.024)	
Constant	0.20***	0.67***	0.32***	0.20***	0.34***	0.24	0.19
	(0.072)	(0.17)	(0.029)	(0.036)	(0.033)	(0.36)	(0.21)
Observations	128	146	74	86	100	57	86
R^2	0.33	0.36	0.40	0.45	0.36	0.46	0.45
Adjusted R^2	0.32	0.34	0.38	0.43	0.34	0.40	0.43
BIC	-212.63	-240.65	-132.15	-137.89	-155.82	-64.95	-133.44

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Tables 36 and 38 show that the effect of import costs and port infrastructure are robust to variation in lag length. The estimation in the last columns show that the conclusion in the main paper remain valid: import costs are significant, whereas port infrastructure is significant.

Fifth and finally, we repeat the estimation with varying lag length across countries, but now using the Akaike information criterion (AIC) instead of the Bayesian information criterion (BIC) to select the number of lags. This leads to a somewhat larger average number of lags, but the second-step regression results on the determinants of the long run pass through do not change.

Table 39: Effect of GDP per capita and continent dummies on long run pass through with lagged dependent variables in the pass through regression using the AIC to select lag length

	(1) LRPT	(2) ln(LRPT)	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT
GDP PC	-1.5e-06***		-3.4e-06***	-5.2e-07	-4.6e-06***	-5.4e-07
	(2.7e-07)		(8.3e-07)	(4.8e-07)	(8.7e-07)	(4.5e-07)
ln(GDP PC)		-.29***				
		(.062)				
GDP PC Squared			4.9e-11**		6.8e-11***	
			(2.0e-11)		(2.0e-11)	
Poor				.046***		.08***
				(.017)		(.019)
Middle				.028**		.037***
				(.014)		(.013)
Africa					-.043***	-.057***
					(.013)	(.014)
Constant	.057***	-1*	.067***	.028**	.082***	.029**
	(.006)	(.57)	(.0071)	(.013)	(.0082)	(.012)
Observations	147	118	147	147	147	147
R^2	0.17	0.16	0.21	0.21	0.26	0.29
Adjusted R^2	0.17	0.15	0.20	0.20	0.25	0.27
BIC	-488.23	342.40	-494.32	-485.49	-499.84	-496.54

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 40: Effect of market integration on long run pass through with lagged dependent variables in the pass through regression using the AIC to select lag length

	(1) LRPT	(2) LRPT	(3) LRPT	(4) LRPT	(5) LRPT	(6) LRPT	(7) LRPT
GDP PC	-0.0000036***	-0.0000039***	-0.0000038***	-0.0000045**	-0.0000043***	-0.0000036	-0.0000048**
	(0.0000011)	(0.00000083)	(0.0000012)	(0.0000019)	(0.0000011)	(0.0000033)	(0.0000019)
GDP PC Squared	5.1e-11**	6.1e-11***	7.1e-11**	8.2e-11	6.1e-11***	5.6e-11	9.0e-11*
	(2.3e-11)	(2.0e-11)	(3.4e-11)	(5.2e-11)	(2.3e-11)	(8.2e-11)	(5.1e-11)
ln(Port Infra)	0.0077					-0.0043	
	(0.022)					(0.044)	
ln(Import Cost)		-0.026***				-0.024	-0.024*
		(0.0095)				(0.017)	(0.012)
NRA			-0.019				
			(0.012)				
ln(TRI)				-0.019***		-0.013	-0.016**
				(0.0065)		(0.0096)	(0.0065)
ln(IDR)					0.0051	-0.0066	
					(0.0053)	(0.011)	
Constant	0.058*	0.25***	0.070***	0.022	0.079***	0.20	0.20**
	(0.030)	(0.068)	(0.0099)	(0.016)	(0.013)	(0.15)	(0.092)
Observations	128	146	74	86	100	57	86
R^2	0.21	0.25	0.29	0.24	0.27	0.33	0.28
Adjusted R^2	0.19	0.23	0.26	0.21	0.25	0.25	0.24
BIC	-425.04	-493.76	-272.57	-256.81	-344.18	-159.15	-256.25

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix E Data Sources

In this section we discuss more extensively the definitions and sources of the data used in the empirical analysis. In turn we discuss the data to calculate the pass through, data on income per capita and the different market integration measures.

Appendix E.1 Data to Calculate pass through

Appendix E.1.1 Local Food Consumer Price Index

Website: http://laborsta.ilo.org/ Select Consumer Price Indices

Consumer price indices of food commodities are from ILO. The ILO collects monthly data on the food component of 191 CPI series. The data are provided by the national statistical agencies and based upon the local definition of the CPI. Still, CPI indices have to comply with certain international standards agreed upon within the ILO. See for further discussion ILO (2004). The list of countries is displayed in table 41.

Several reported series contain different base years. To account for this we adopted three different rebasing methods according to data availability. First, CPIs with overlapping series were rebased using the CPI ratio in the overlapping period. Countries rebased in this way include Bahamas, Belarus, Congo, Ethiopia, Kenya, Mali, Morocco, Myanmar, Nicaragua, Philippines, Sierra Leone, South-Africa, Spain, Sri Lanka, Turkey and Zambia. Second for indices based on different years without overlapping periods, we used the growth rate from period t-2 and t-1 to interpolate the value for period t, with t the period in which another base year begins.The remainder of the series is then rebased multiplying by the ratio of the old and the new value in period t. Countries rebased in this way include Albania, Angola, Bahrain, Brazil, Brunei, Bulgaria, Cambodia, Chile, Cote d'Ivoire, Czech Republic, Dominica, Ecuador, Egypt, El Salvador, Equatorial Guinea, French Polynesia, Gabon, Germany, Guadeloupe, Estonia, Ethiopia, Finland, French Guiana, Guinea-Bissau, Hong Kong, Iran, Korea, Laos, Moldova, Mali, Madagascar, Mongolia, Morocco, Myanmar, Namibia, Nepal, Netherlands, Niger, Norway, Paraguay, Peru, Philippines, Poland, Senegal, Spain, Tanzania, Togo, Turkey, Ukraine, Venezuela and Zimbabwe. Third, there are

Table 41: List of countries reporting food price index to ILO

Albania	Dominica	Kuwait	South-Korea
Algeria	Dominican Republic	Kyrgyzstan	Romania
American Samoa**	Ecuador*	Laos	Russian Federation
Andorra**	Egypt	Latvia	Rwanda
Angola	El Salvador	Lesotho	Saint Helena**
Anguilla**	Equatorial Guinea	Lithuania	Saint Kitts and Nevis***
Antigua and Barbuda***	Estonia	Luxembourg	Saint Lucia
Argentina	Ethiopia	Macao**	Saint Vincent and the Grenadines
Armenia	Faeroe Islands**	Madagascar	Samoa
Aruba**	Fiji	Malawi	San Marino**
Australia***	Finland	Malaysia	Saudi Arabia
Austria	France	Maldives	Senegal
Azerbaijan*	French Guiana**	Mali	Seychelles
Bahamas	French Polynesia**	Malta	Sierra Leone
Bahrain	Gabon	Marshall Islands**	Singapore
Bangladesh	Gambia	Martinique**	Slovakia
Barbados	Georgia	Mauritania	Slovenia
Belarus	Germany	Mauritius	Solomon Islands
Belgium	Ghana	Mexico	South Africa
Belize***	Gibraltar**	Moldova	Spain
Benin	Greece	Mongolia	Sri Lanka
Bermuda**	Greenland**	Morocco	Suriname
Bhutan***	Grenada	Mozambique	Swaziland
Bolivia	Guadeloupe**	Myanmar***	Sweden
Botswana	Guam**	Namibia	Switzerland
Brazil	Guatemala	Nepal	Syria
British Virgin Islands**	Guinea	Netherlands	Taiwan
Brunei	Guinea-Bissau	Netherlands Antilles**	Thailand
Burkina Fasso	Guyana	New Caledonia**	Macedonia
Burundi	Haiti	New Zealand	Togo
Cambodia	Honduras	Nicaragua	Tonga
Cameroon	Hong Kong	Niger	Trinidad and Tobago
Canada	Hungary	Nigeria	Tunisia
Cayman Islands**	Iceland	Niue**	Turkey
Central African Republic	India	Norfolk Island**	Tuvalu*
Chad	Indonesia	Northern Mariana Islands**	Uganda
Chile	Iran	Norwy	Ukraine
China	Ireland	Oman	United Kingdom
Colombia	Isle of Man**	Pakistan	Tanzania
Congo	Israel	Panama	United States of America
Cook Islands**	Italy	Papua New Guinea***	Uruguay
Costa Rica	Jamaica	Paraguay	Vanuatu***
Croatia	Japan	Peru	Venezuela
Cuba**	Jersey**	Philippines	Vietnam
Cyprus	Jordan	Poland	West Bank and Gaza**
Czech Republic	Kazakhstan	Portugal	Zambia
Cote d'Ivoire	Kenya	Puerto Rico**	Zimbabwe***
Denmark	Kiribati***	R_union**	

*Countries dropped because of missing exchange rate data
**Countries dropped because of missing income per capita data
***Countries dropped for other reasons (discussed in the text)

some series for which some months were missing. We interpolated the missing values by assuming that CPIs changed at a constant rate in the missing periods from the last period for which data were available to the next period in which data were available. Rebased countries include Costa Rica and Panama. After the rebasing all CPI series have as base year 2000, i.e. the index is equal to 100 in 2000.

Appendix E.1.2 Exchange Rates:

Websites: http://www.imf.org/external/data.htm and http://data.worldbank.org/

Historical exchange rates are drawn from IMF and the World Bank. When monthly exchange rates are not available, annual series are extrapolated. Due to the lack of exchange rate data, we had to drop the three countries Azerbaijan, Ecuador and Tuvalu, thus reducing the sample to 188.

Ten more countries were dropped from the sample for various reasons. Antigua and Barbuda and Saint Kitts and Nevis were dropped as these countries only have 2 respectively 1 year of food price index data. Australia, Belize, Bhutan, Kiribati, Papua New Guinea and Vanuatu were dropped as there are only quarterly or semi-annual data for these countries. Zimbabwe was dropped because of hyperinflation. Myanmar was dropped since the strongly upward trend in food prices cannot be accounted for by world food prices and exchange rates. So, there seems to be a big problem with the exchange rates data for this country. So, for the estimations we are left with 178 countries.

Appendix E.1.3 World Food Price Index

Website: http://www.fao.org/worldfoodsituation/wfs-home/foodpricesindex/en/

The price of internationally traded food is attained from the world food price index (WFPI) composed by FAO. The website states: 'The FAO Food Price Index is a measure of the monthly change in international prices of a basket of food commodities. It consists of the average of five commodity group price indices (representing 55 quotations), weighted with the average export shares of each of the groups for 2002-2004.'

Appendix E.2 Income Data

Website: http://data.worldbank.org/.

We use GDP per capita in PPP terms. The three income groups are low (less than $770 per capita GDP at year 2000 prices) defined as group "poor", lower and higher middle income ($770-$9300) defined as group "middle" and high income defined as group "rich" (more than $9300). On 31 countries we do not have income information, thus reducing the sample to 147. The countries with missing income data are: Anguilla, West Bank and Gaza, Guadeloupe, Macao, Isle of Man, French Polynesia, Cuba, Aruba, Bermuda, French Guiana, Netherlands Antilles, Niue, Saint Helena, Gibraltar, American Samoa, Cayman Islands, Guam, New Caledonia, Northern Mariana Islands, Andorra, Jersey, San Marino, Marshall Island, Puerto Rico, Cook Islands, Norfolk Island, Faeroe Islands, British Virgin Islands, Martinique, Greenland and R_union.

Appendix E.3 Market Integration Data

Appendix E.3.1 Geography and Infrastructure Related Trade Costs

Website: http://data.worldbank.org/topic/private-sector

The quality of infrastructure data are from Doing Business (2012) and the World Economic Forum's Executive Opinion Survey (Schwab, 2012). We included the following indicators in the main regressions and robustness checks (the definitions are from the website):

Quality of port infrastructure

'Quality of port infrastructure measures business executives' perception of their country's port facilities. Data are from the World Economic Forum's Executive Opinion Survey, conducted for 30 years in collaboration with 150 partner institutes. The 2009 round included more than 13,000 respondents from 133 countries. Sampling follows a dual stratification based on company size and the sector of activity. Data are collected online or through in-person interviews. Responses are aggregated using sector-weighted averaging. The data for the latest year are combined with the data for the previous year to create a two-year moving average. Scores range from 1 (port infrastructure considered extremely underdeveloped) to 7

(port infrastructure considered efficient by international standards). Respondents in landlocked countries were asked how accessible are port facilities (1 = extremely inaccessible; 7 = extremely accessible).'

Percentage of paved roads

'Paved roads are those surfaced with crushed stone (macadam) and hydrocarbon binder or bituminized agents, with concrete, or with cobblestones, as a percentage of all the country's roads, measured in length.'

Liner shipping connectivity index

'The liner shipping connectivity Index captures how well countries are connected to global shipping networks. It is computed by the United Nations Conference on Trade and Development (UNCTAD) based on five components of the maritime transport sector: number of ships, their container-carrying capacity, maximum vessel size, number of services, and number of companies that deploy container ships in a country's ports. For each component a country's value is divided by the maximum value of each component in 2004, the five components are averaged for each country, and the average is divided by the maximum average for 2004 and multiplied by 100. The index generates a value of 100 for the country with the highest average index in 2004.The underlying data come from Containerisation International Online.'

Time to export

'Lead time to export is the median time (the value for 50 percent of shipments) from shipment point to port of loading. Data are from the Logistics Performance Index survey.'

Time to import

'Lead time to import is the median time (the value for 50 percent of shipments) from port of discharge to arrival at the consignee. Data are from the Logistics Performance Index survey.'

Logistics Performance Index

'Logistics Performance Index overall score reflects perceptions of a country's logistics based on efficiency of customs clearance process, quality of trade- and transport-related infrastructure, ease of arranging competitively priced shipments, quality of logistics services, ability to track and trace consignments, and frequency with which shipments reach the consignee within the scheduled time. The index ranges from 1 to 5, with a higher score representing better performance. Data are from Logistics Performance

Index surveys conducted by the World Bank in partnership with academic and international institutions and private companies and individuals engaged in international logistics. 2009 round of surveys covered more than 5,000 country assessments by nearly 1,000 international freight forwarders. Respondents evaluate eight markets on six core dimensions on a scale from 1 (worst) to 5 (best). The markets are chosen based on the most important export and import markets of the respondent's country, random selection, and, for landlocked countries, neighbouring countries that connect them with international markets. Scores for the six areas are averaged across all respondents and aggregated to a single score using principal components analysis. Details of the survey methodology and index construction methodology are in Arvis and others' Connecting to Compete 2010: Trade Logistics in the Global Economy (2010).'

Appendix E.3.2 Policy Related Trade Costs

We collected three types of policy related trade costs, the TRI, the NRA and general measures on the costs of doing business internationally.

TRI Website: http://siteresources.worldbank.org/INTRES/Resources/469232-1107449512766/Variable_descriptionOT

The Trade restrictiveness index (TRI) measures the uniform tariff equivalent of tariff and non tariff barriers as proposed by Anderson and Neary (1994) and calculated for the agricultural sector by Kee, et al. (2009). We estimate the impact of two types of TRIs, based both upon MFN and applied tariffs and non tariff barriers, generating in total four measures (definitions are from the website):

TRI MFN and Applied

'Overall Trade Restrictiveness Index (OTRI): The OTRI captures the trade policy distortions that each country imposes on its import bundle. It measures the uniform tariff equivalent of the country tariff and non-tariff barriers (NTB) that would generate the same level of import value for the country in a given year. Tariffs can be based on the MFN tariffs which applied to all trading partners, or the Applied tariffs, which takes into account the bilateral trade preferences. The ad valorem equivalent of NTB were estimated by Kee, et al. (2009).'

TRI Tariff MFN and Applied

'Tariff-only Overall Trade Restrictiveness Index (OTRI_T): The OTRI_T is the OTRI that only focuses on tariffs of each country. No NTBs are considered in the calculation of OTRI_T. Similar to OTRI, tariffs can be based on both MFN and Applied tariffs.'

NRA Website: www.worldbank.org/agdistortions

The national rate of assistance (NRA) measures both trade related and domestic distortions in agriculture and collected by Anderson et al. (2008). Several variants are provided on the website and we included the following measures as regressors (definitions are from the website):

'NRA_covt

NRA to output conferred by border market price support, value of production-weighted average of covered products + NRA to output conferred by domestic market price support, value of production-weighted average of covered products + NRA cov inputs

NRA_cov_dms

NRAdms, Nominal Rate of Assistance to output conferred by domestic price support, by product

NRA_cov_bms

NRAbms, Nominal Rate of Assistance to output conferred by border market price support, by product

NRA_bms_covm

NRA to output conferred by border market price support, value of production-weighted average of covered products, only IMPORTABLES

NRA_bms_covx

NRA to output conferred by border market price support, value of production-weighted average of covered products, only EXPORTABLES

NRA_covm

NRA covered products, value of production-weighted average, Importables

NRA_covx

NRA covered products, value of production-weighted average, Exportables

NRA_tott

NRA All (primary) Agriculture, TOTAL for covered and non-covered and NPSA, Value of production-weighted average.

NRA_totp

NRA All (primary) Agriculture, TOTAL excluding NPSA

NRA_totm

NRA All (primary) Agriculture, Value of production-weighted average, Importables

NRA_totx

NRA All (primary) Agriculture, Value of production-weighted average, Exportables

NRA_agtrad

NRA Tradables-only in (primary) Agriculture, Value of production-weighted average.

NRA_totd

NRA Total Ag., including NPSA and decoupled payment (in high-income and other relevant countries)

NRA_agtrad_decpay

NRA Ag Tradables, including decoupled support in high-income and other relevant countries'

Costs of Doing Business Internationally Website: http://data.worldbank.org/topic/private-sector

The trade cost measures on the costs of doing business internationally are collected by the World Bank (Doing Business, 2012) and the World Economic Forum's Executive Opinion Survey (Schwab, 2012), consisting of the following indicators (definitions are from the World Bank website).

Custom burden

'Burden of Customs Procedure measures business executives' perceptions of their country's efficiency of customs procedures. The rating ranges from 1 to 7, with a higher score indicating greater efficiency. Data are from the World Economic Forum's Executive Opinion Survey, conducted for 30 years in collaboration with 150 partner institutes. The 2009 round included more than 13,000 respondents from 133 countries. Sampling follows a dual stratification based on company size and the sector of activity. Data are collected online or through in-person interviews. Responses are aggregated using sector-weighted

averaging. The data for the latest year are combined with the data for the previous year to create a two-year moving average. Respondents evaluated the efficiency of customs procedures in their country. The lowest score (1) rates the customs procedure as extremely inefficient, and the highest score (7) as extremely efficient.'

Clear exports

Average time to clear exports through customs is the average number of days to clear direct exports through customs.

Import and export costs

'Cost measures the fees levied on a 20-foot container in U.S. dollars. All the fees associated with completing the procedures to export or import the goods are included. These include costs for documents, administrative fees for customs clearance and technical control, customs broker fees, terminal handling charges and inland transport. The cost measure does not include tariffs or trade taxes. Only official costs are recorded. Several assumptions are made for the business surveyed: Has 60 or more employees; Is located in the country's most populous city; Is a private, limited liability company. It does not operate within an export processing zone or an industrial estate with special export or import privileges; Is domestically owned with no foreign ownership; Exports more than 10% of its sales. Assumptions about the traded goods: The traded product travels in a dry-cargo, 20-foot, full container load. The product: Is not hazardous nor does it include military items; Does not require refrigeration or any other special environment; Does not require any special phytosanitary or environmental safety standards other than accepted international standards.'

Import and export documents

'All documents required per shipment to export goods are recorded. It is assumed that the contract has already been agreed upon and signed by both parties. Documents required for clearance by government ministries, customs authorities, port and container terminal authorities, health and technical control agencies and banks are taken into account. Since payment is by letter of credit, all documents required by banks for the issuance or securing of a letter of credit are also taken into account. Documents that are renewed annually and that do not require renewal per shipment (for example, an annual tax clearance

certificate) are not included.'

Import days

'Time to import is the time necessary to comply with all procedures required to import goods. Time is recorded in calendar days. The time calculation for a procedure starts from the moment it is initiated and runs until it is completed. If a procedure can be accelerated for an additional cost, the fastest legal procedure is chosen. It is assumed that neither the exporter nor the importer wastes time and that each commits to completing each remaining procedure without delay. Procedures that can be completed in parallel are measured as simultaneous. The waiting time between procedures–for example, during unloading of the cargo–is included in the measure.'

Export days

'Time to export is the time necessary to comply with all procedures required to export goods. Time is recorded in calendar days. The time calculation for a procedure starts from the moment it is initiated and runs until it is completed. If a procedure can be accelerated for an additional cost, the fastest legal procedure is chosen. It is assumed that neither the exporter nor the importer wastes time and that each commits to completing each remaining procedure without delay. Procedures that can be completed in parallel are measured as simultaneous. The waiting time between procedures–for example, during unloading of the cargo–is included in the measure.'

Appendix E.4 Product Market Regulation Data

Website: http://stats.oecd.org/ (data) and http://www.oecd.org/regreform/reform/44754695.pdf (description of data)

The product market regulation data are collected by the OECD and described in Conway (2005) and Woelfl (2009). We use the indicators on sectoral regulation in retail trade (Definitions of the variables are from the website).

Summary: Average of all measures below

Barriers to Entry: Average of the two measures below

Reg. Comm. Register: When establishing a new outlet to sell food is it necessary to register in a

commercial register?

Lic. Comm. Activity: Do new outlets selling food need licenses or permits to engage in commercial activity (type 2); If licences or permits are required for selling food (type 2) are they product specific?; If licences or permits are required for selling food (type 2) do they relate to a certain type of activity?

Reg. Large Outlets: What is the threshold surface limit at which regulation of large outlets applies?

Operat. Restrictions: Average of the two measures below

Prot. Existing Firms: Are professional bodies or representatives of trade and commercial interests involved in; Are there products that can only be sold in outlets operating under a local or national legal monopoly

Opening Hours Shops: Are shop opening hours regulated?; At which level of government are regulations on shop opening hours applied?

Upper and Lower Price Controls: Are the prices of certain products subject to price controls?; Are the retail prices of Certain staples (e.g. milk and bread) subject to price controls?; Are the retail prices of Gasoline subject to price controls? Are the retail prices of Tobacco subject to price controls? Are the retail prices of Alcohol subject to price controls?; Are the retail prices of Pharmaceuticals subject to price controls?; Are the retail prices of other products subject to price controls?