

This Draft is mid-revision: subject to change

Distribution services and the impact of trade on producer and consumer prices *

Joseph Francois
*Johannes Kepler Universität Linz,
and CEPR*

Miriam Manchin
University College London

Hanna Norberg
University of Lund

October 17, 2012

Abstract

We examine the differential impact of import prices on consumer and producer prices. This includes developing a framework with distribution costs, oligopoly markups, and distribution sector market power against suppliers that contribute to variations in pass-through. Differences between consumer and producer price pass-through is evidence of market power in the trade and distribution sector. We then examine pass-through from import prices to consumer and producer prices in the euro-zone Members for the period 1996-2006. We find substantially more impact on European producer prices than on consumer prices. The degree of consumer price impact varies substantially across countries and products. Part of this variation in pass-through is linked to market structure in the retail and distribution sectors. The clothing sector is examined in more details in the paper as it provides a good example for substantial external liberalization over the period.

Keywords: Pass-through, imports and prices, European Union
JEL codes: F42, F36, F14

*all views expressed in this paper are strictly those of the authors, and do not reflect the official views or positions of any institution with which they may be affiliated, or of anyone at those institutions.

1 Introduction

Since the mid-1990s, the combination of multilateral and bilateral trade agreements has led to a steady reduction in European barriers to external trade. The expectation has been that the resulting drop in prices at the border would lead to both gains for consumers and increased competitive pressure on European industry. In this paper, we examine the extent to which changes in border prices have actually reached European consumers, and the extent to which European producers have faced increased pressure linked to pricing.

While we are interested in the impact of import protection, the question is closely related to that emphasized in the exchange rate pass-through literature. The focus of this literature has been on pass-through to import prices, (e.g. Campa and Goldberg (2005), Campa et al (2005), Feinberg (2008), Gaulier et al. (2008)) domestic producer prices, (e.g. see Feinberg (1989), Feinberg and Kaplan (1992), Feinberg (1996)) as well as to consumer prices (e.g. Campa and Goldberg (2006), Frankel et al (2005), Hellerstein (2006), Ihrig et al. (2006) and Mishkin (2008)). A basic finding is that pass-through is far from complete. Indeed, while border prices are shown to be quite sensitive to changes in import prices, consumer prices have been shown to be much less so. Furthermore, there is a substantial heterogeneity when looking at pass-through across both industries and countries. The literature offers a range of explanations for the incomplete consumer linked to exchange rate changes. For import prices, the underlying reasons range from domestic pricing (Bachetta and van Wincoop, 2003, law of one price, Betts and Kehoe, 2006), currency pricing and strategies of the exporting firms, (Campa and Goldberg, 2005 and 2006) trade costs (Fitzgerald, 2008) and frequency of price adjustments (Gopinath and Itskhoki, 2008). For consumer prices, the literature highlights costs added in the distribution sector. For example, Burstein et al. (2003) show that the share of the distribution costs for the average consumer good is between 40 and 60 percent. Another important factor in determining the pass-through to consumers is the level of competition in the retail sector. Literature along these lines includes Feenstra (1996), Feinberg (1986 and onwards), and Yang (1997).¹

In this paper, we examine the differential impact of changes in import prices on consumer and producer prices in the EU. We make a number of contributions relative to the existing literature. First, we examine the impact on both consumer and producer prices in a unified framework which involves joint treatment of oligopoly power for retailers vis-à-vis consumers and oligopsony power vis-à-vis suppliers. Due to the framework allowing for both types of market power we call this framework a "double margin framework".

¹For theoretical models on the importance of the distribution sector, see Corsetti and Dedola (2005), Richardson (2004), Raff and Schmitt (2008), Francois and Wooton (2010), as well as the survey by Francois and Hoekman (2010).

In addition, we place emphasis on transmission of trade policy changes rather than exchange rate changes.² Finally, our sample is based on the eurozone countries. This allows us to examine border price transmission in a common currency setting where, in contrast to the United States, we can expect wide variation across EU States linked to differences in regulatory and retail structures.

We proceed as follows. To formalize the link between internal producer and consumer price transmission, we first analytically decompose in our theoretical model factors driving price changes (distribution costs and distribution sector market power) that are expected to contribute to variations in pass-through. Differences between consumer and producer price pass-through are determined by market power in the trade and distribution sector. Building on the resulting theory, we then examine pass-through to consumer and producer prices from import prices empirically in the EMU-12 Members for the period 1996-2006. Our sample population is characterized by a common trade policy, identical exchange rate changes, as well as a well-integrated set of markets at the industry level, but also with relatively segmented trade and distribution sectors. We quantify the transmission of border price changes, from both tariff changes and exchange rate movements, into both European producer prices and consumer prices. The results show that there is substantially more impact on European producer prices than on consumer prices. Furthermore, the degree of consumer price impact varies considerably across countries. Substantial external liberalization over the sample period took place thus providing an interesting example on the extent to which this external liberalization resulted in lower prices for consumers and producers. The paper is organized as follows. In section two, we offer a theoretical framework from which we derive the basic estimating equations for our empirical exercise in section three. In section four we offer concluding comments.

2 Theory

We start by developing an analytical framework where consumers buy a mix of imported and competing domestic goods. These goods reach consumers through a trade and distribution sector that exercises market power (oligopoly) vis-à-vis consumers, and also market power vis-à-vis both domestic and foreign suppliers (oligopsony). The result is that international trade and the transmission of prices and trade costs to consumers (and consuming downstream industries in the case of intermediate goods) depends on a double margin mechanism linking border prices to consumer prices and competing producer prices. This mechanism

²Feenstra (1987) and Dornbusch (1987) have both stressed that the mechanism behind exchange rate pass-through and real border price pass-through are analogous and, can thus be expected to work the same way for tariff reductions as well. However, the literature on trade policy pass-through is limited. See for example Francois and Wooton (forthcoming), Bloningen and Hayes (2002), and Raff and Scmitt (2008).

is itself a function of varying degrees of oligopoly and oligopsony power.

In formal terms, we assume that imports are supplied by a foreign or external sector according to the import supply function in equation (1) below.

$$(1) \quad P_{cif} = F(q_M) F' > 0$$

In equation (1), P_{cif} is the c.i.f. price before duties, and valued at the foreign exchange rate, while q_M is the quantity of imports. We convert P_{cif} to a landed price for imports P_M by applying the exchange rate e and the tariff $T = 1 + \tau$. This yields equation (2).

$$(2) \quad P_M = e \cdot T \cdot P_{cif} = e \cdot T \cdot F(q_M)$$

There is also a home or internal industry that competes with imports in supplying the trade and distribution chain that leads to final consumers.³ It is also characterized by a standard upward sloping supply schedule.

$$(3) \quad P_H = S(q_H) S' > 0$$

In equation (3), q_H is home supply, and P_H is the price paid to home or internal market producers. To round out the basic conditions for the market, we add consumer demand, where price is inversely related to total supply.

$$(4) \quad P_D = D(q_M + q_H) = D(Q) D' < 0$$

In equation (4), P_D represents domestic prices at the final consumer level. We now introduce n intermediaries (distribution and trade firms) who buy goods q at price P_M or P_H , incur an intermediation cost, and then sell these goods on to consumers at price P_D . These intermediary or middle firms behave in Cournot-Nash fashion, setting quantities bought from suppliers and sold to consumers to maximize profits. Profit for any firm j is then:

$$(5) \quad \pi_j = (P_C - P_M) \cdot q_{Mj} + (P_C - P_H) \cdot q_{Hj} - C(q_M + q_H)$$

³Note that for the empirics that follow, it makes sense to think of a European domestic industry, and a competing extra-European industry. We could elaborate the present structure to include numerous sources of supply, with varying degrees of oligopsony power captured through the first derivatives of the corresponding supply curves.

In equation (5), π_j is firm profit, q_{Mj} and q_{Hj} are firm sales of imports and domestic goods, and $C(\cdot)$ the total cost for intermediate trade and distribution services assumed to be a function of total volume. Assuming a constant per-unit cost ς for trade and distribution services, the first order conditions for profit maximization are:

$$(6) \quad \partial\pi_j/\partial q_{Hj} = q_j D' \partial Q / \partial q_{Hj} + P_C - P_H - q_{Hj} S' \partial q_H / \partial q_{Hj} - \varsigma = 0$$

$$(7) \quad \partial\pi_j/\partial q_{Mj} = q_j D' \partial Q / \partial q_{Mj} + P_C - P_M - q_{Mj} F' \partial q_M / \partial q_{Mj} - \varsigma = 0$$

With standard Cournot-Nash assumptions, from the first order conditions for profit maximization (6) and (7) we can derive the following equilibrium relationships between prices at the border P_M from external suppliers, factory gate prices for internal market suppliers P_H , and prices for consumers on store shelves P_C .

$$(8) \quad \left(\left(\frac{q_j}{Q} \right) \varepsilon_D^{-1} + 1 \right) P_C = \left(\left(\frac{q_{Hj}}{Q_H} \right) \varepsilon_{SH}^{-1} + 1 \right) P_H + \varsigma$$

$$(9) \quad \left(\left(\frac{q_j}{Q} \right) \varepsilon_D^{-1} + 1 \right) P_C = \left(\left(\frac{q_{Mj}}{Q_M} \right) \varepsilon_{SM}^{-1} + 1 \right) P_M + \varsigma$$

In equations (8) and (9), ε_D is the elasticity of demand corresponding to equation (4), ε_{SH} is the elasticity of supply corresponding to equation (3), and ε_{SM} is the elasticity of import supply corresponding to equations (1) and (2). To streamline what follows, we now introduce the following additional notation:

$$(10) \quad \phi_j = \left(n^{-1} \varepsilon_{Sj}^{-1} + 1 \right) \quad j = H, M$$

$$(11) \quad \mu = \left(n^{-1} \varepsilon_D^{-1} + 1 \right)^{-1}$$

where ϕ represents oligopsony price-cost margin coefficients (the difference between producer price and perceived marginal cost), and μ represents oligopoly price-cost markup coefficients (the difference between price and perceived marginal revenue). We refer to these in the text that follows as mark-down (ϕ) and mark-up (μ) coefficients. They represent the spread between consumer price and marginal cost (ϕ), and between marginal cost and producer or supply price (μ). With these terms we can simplify equations (8) and (9). This yields (12) and (13) below.

$$(12) \quad P_C = \mu (\phi_H P_H + \varsigma)$$

$$(13) \quad P_C = \mu (\phi_M P_M + \varsigma)$$

From the first order conditions for profit maximization, (10)-(13) are mappings of marginal revenue, marginal cost, and prices in our Cournot-Nash double margin model with both domestic and foreign sources of supply. Because marginal revenues are the same on the left hand side, equations (12) and (13) also give us an immediate link between producer prices P_H and the internal price for landed imports P_M that reflects relative monopsony power.

Taking derivatives, we can relate changes in consumer prices and internal producer prices to a mix of market power measures, pass-through coefficients, and border prices for external goods. Starting from equation (13), we have

$$(14) \quad \hat{P}_C = \hat{\mu} + \frac{\phi_M P_M}{(\phi_M P_M + \varsigma)} (\hat{\phi}_M + \hat{P}_M) = (\hat{\mu} + \gamma_M \hat{\phi}_M) + \gamma_M \hat{P}_M$$

where $\gamma_M = \phi_M P_M (\phi_M P_M + \varsigma)^{-1}$ is the share of imports in total marginal cost for goods sources abroad. From a similar manipulation of equation (12), combined with substitution from equation (14), we can also link internal producer prices directly to import prices.

$$(15) \quad \hat{P}_H = \gamma_H^{-1} (\gamma_M \hat{\phi}_M - \gamma_H \hat{\phi}_H) + \gamma_H^{-1} \gamma_M \hat{P}_M$$

where $\gamma_H = \phi_H P_H (\phi_H P_H + s_H)^{-1}$ is the share of domestic goods in total marginal cost for goods sources at home. Together, equations (14) and (15) give us a measure of pass-through from border prices to both internal producer prices and consumer prices. Based on equations (10)-(15) we make the following observations.

Observation 1 *The direct pass-through from changes in border prices to changes in consumer prices is reduced with a greater service sector cost component ς such that the term γ_M is reduced. (See equation 14.)*

Observation 2 *Changes in consumer prices also depend, in part, on changes in market power as exercised against both consumers and suppliers. (Again see equation 14.)*

Observation 3 *On the producer price side, the direct pass-through from changes in border prices to changes in internal producer prices depends on cost share differences. (See equation 15.)*

Observation 4 *Overall, the difference between import price and producer price changes follows in part from changes in oligopsony power. (Again see equation 15).*

The combined definitions of market power coefficients in equation (10)-(11) also point to possible indirect mechanisms linking trade policy to both producer and consumer prices. This is because the market power

terms in equations (10) and (11) enter in equations (14) and (15). This leads us to the following additional observations.

Observation 5 *When lower sales volumes (with increased border protection) lead to discernibly less elastic consumer demand, import protection will lead to rising markups μ .*

Observation 6 *At the same time, where higher import volumes following liberalization also mean less elastic import supply, import protection will lead to falling markdowns ϕ . (This is clear from differentiation of equation 10).*

Observation 7 *If increased import volumes from trade liberalization lead to a combination of more inelastic import supply and increasingly elastic consumer demand, the impact of import policy changes on total margins (the combined effect of changes in μ and ϕ) and hence on price will be ambiguous, even while the composition of retailer and distribution margins on imports will shift from consumer level markups to more market power exercised against foreign suppliers.*

Observation 8 *A change in import supply such that supply is more elastic (unlike as stated in Observation 6) means lower markdowns (less leverage on supply price). This could follow for example from significant growth on the part of supplying countries. (This is clear from differentiation of equation 10).*

Cases where Observation 5 apply preclude iso-elastic demand curves, while Francois and Wooton (2010) explore the linear case. Alternatively, trade liberalization should lead to increasing overall retailer margins. This is clear from differentiation of equation (10).

3 Empirics

3.1 data

We work with data from a number of different sources, namely EUROSTAT (consumer prices, import protection), COMTRADE (trade data), WITS (import protection) and the IMF (exchange rates). Organizing the data has involved mapping detailed trade data to detailed consumer price series for all individual member states. Our trade and price data cover the period 1996-2006. The HICP (harmonized index of consumer prices) data from EUROSTAT on prices contain both detailed product prices, and the general level of consumer prices. Trade data include quantity, and value of trade data for detailed product categories.⁴ From

⁴About 8% of the data had missing quantities. Since for the analysis we use unit values, missing observations had to be eliminated from the analysis, together with observations where the quantities were not recorded in weight.

the quantity and value data we calculate unit values which we use as a proxy for import prices. This is a common practice in the literature (see for example Schott (2004), Hummels and Lugovskyy (2009), Bekkers, et al. (2012) among others). Eurostat's import price data (which is only available at aggregate level) is also based on unit value data.

In order to be able to merge trade and price data, which are constructed and reported in different product classifications, we have mapped HS1996 trade data into the CPCv.1.0 classification and then mapped this classification into the COICOP classification in which the price data are recorded.⁵ The product sectors by HICP category are listed in Table 5 in the Annex.

From the trade data, unit value indexes for individual products were calculated with the same base year (1996) as the consumer price indexes for the same products and were then deflated as appropriate by general prices. In addition, we have merged import protection data with our trade and price data. This is based on HS1996 data from the World Bank-UNCTAD WITS database system, supplemented with OECD/GTAP data on protection for food sectors. The data on import protection was used to calculate the landed price of imported products.

At the end of the process outlined above, we are left with three different price variables in our panel dataset including data for the euro-zone member countries over the period 1996-2006. Each price variable is an index of prices with 1996 being the base year (1996=100). \hat{P}_C is the consumer price index. \hat{P}_M is the corresponding landed price of imports which is calculated from import (originating from outside EU) unit values by applying the applied tariff rates, deflating and calculating the price index (1996=100).⁶ Figure 1 depicts the average EU tariffs on imports from 1996 till 2006. At the aggregate level there has been an important reduction tariff barriers on EU imports.

We also work with an index of competition in the retail distribution sector, based on Conway and Nicoletti (2006) and Boylaud and Nicoletti (2001). This index is a composite measure of restrictions on price competition, barriers to entry, and operational limitations on competition. It is based on the OECD Regulatory Indicators Survey. The index covers individual countries for the years 1996, 2003, and 2008. We have interpolated for the intermediate years.

Finally, \hat{P}_H is the corresponding producer price index (1996=100). Since directly comparable data on producer prices by HICP are not available from EUROSTAT, in our main specifications we use import unit

⁵The merging of these two data sets, have resulted in a few products, for which there were no corresponding product codes in HS, which consequently had to be omitted from the analysis.

⁶Exchange rates were not actually fixed within the future Euro zone until 1st January 1999. For the first three years of the sample there are some very limited exchange rate fluctuations between some pairs of future member countries. However, these are quite small, and the period was marked by deliberate synchronization of monetary policy. Values in our sample are converted with actual rates.

value data of intra-EU trade as a proxy for producer prices for European industry (while our import price is based on import unit value data of extra-EU trade). Thus for each country the average unit value of imported goods from other EU members provides us with a proxy for producer prices. All tariff barriers were removed within the EU more than fifty years ago, in addition, a common internal market has also been achieved which is functioning specially in the case of goods trade. The EU internal market has been reinforced through several reform programs starting from 1986. The aim of these continuous reforms was to remove all remaining non-tariff barriers and to achieve a well-integrated common market without barriers to sell goods and services in other Member states' markets. Given this integrated market, intra-EU import unit values of goods thus can provide with a proxy for producer prices in the EU market, and allows us to map producer prices to the same HICP categories used for consumer prices.

Nevertheless, to assess the robustness of our producer price index, we also cross-check the results using a producer price index obtained from Eurostat at aggregate level. The two main shortcoming of these data from Eurostat is that they are designed for industrial activity and that it is available only for three main aggregate categories. Given the construction of the data it includes many products and activities which are not destined for consumption. This is particularly problematic for us since we are interested in pass-through in consumer goods, in other words in products which are classified in the COICOP classification. This bias created by the inclusion of non-consumption products in the price index might be more pronounced at aggregate level. Nevertheless, this data can provide us a robustness check against our constructed producer price index.

3.2 estimating framework

We next turn to empirics, based on the framework developed above. In the empirics that follow, we focus our attention on equations (14) and (15) above, estimating the rate of pass-through itself, and changes in market power. The focus here is on the euro-zone countries⁷ characterized by a common trade policy and common currency with uniform exchange rate movements. We estimate versions of equations (14) and (15) as a system, thus estimating both structural equations simultaneously instead of estimating the equations

⁷Belgium-Luxembourg, Germany, Ireland, Greece, Spain, France, Italy, Netherlands, Austria, Portugal, Finland, furthermore we also include Denmark given that during the period it had a fixed peg to the euro.

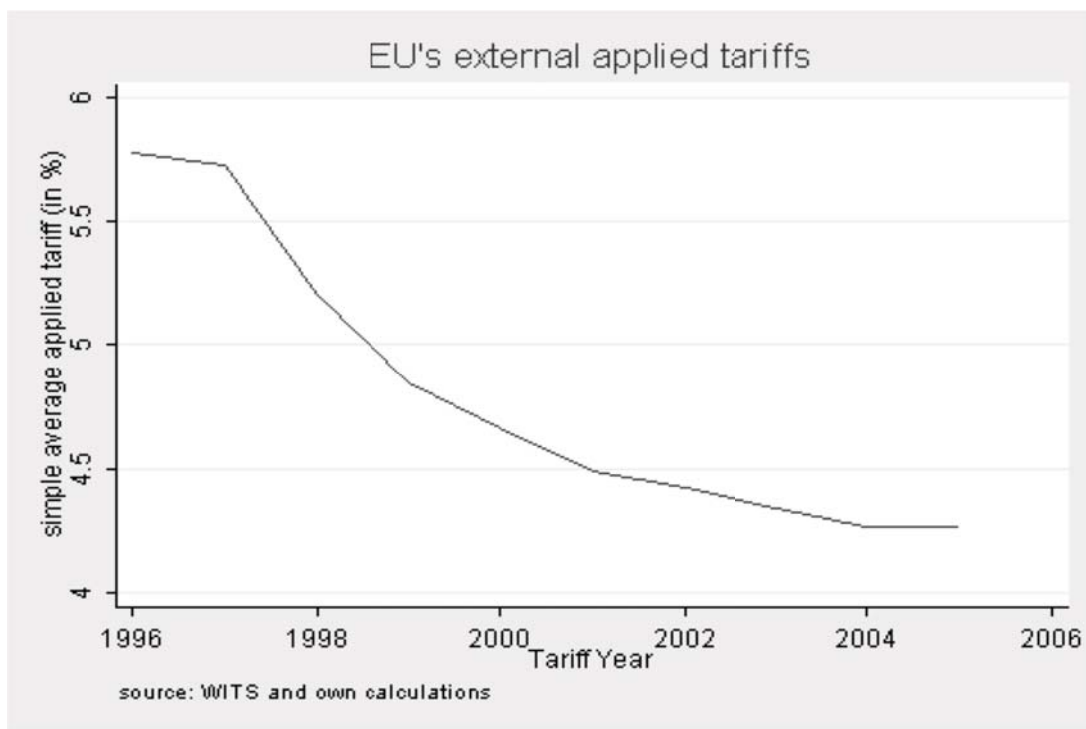


Figure 1: Evolution of EU's external tariffs over time

separately.

$$(16) \quad \hat{P}_C = \left(\hat{\mu} + \gamma_M \hat{\phi}_M \right) + \gamma_M \hat{P}_M = b_{0C} + b_{1C} \hat{P}_M$$

$$(17) \quad \hat{P}_H = \gamma_H^{-1} \left(\gamma_M \hat{\phi}_M - \gamma_H \hat{\phi}_H \right) + \gamma_H^{-1} \gamma_M \hat{P}_M = b_{0H} + b_{1H} \hat{P}_M$$

More precisely, we estimate equations (16) and (17) as seemingly unrelated regression models (Zellner 1962). We estimate these equations as a system as the regressions of these equations are expected to be related because the (contemporaneous) errors associated with the dependent variables may be correlated. The tables presenting results provide a test for this correlation.

Note that equations (16) and (17) define changes in prices, and as such we are mapping differences in the rate of change in landed import prices, relative to the rate of change in both consumer and producer prices, to changes in market power and service cost margins. In particular, the term $b_{0C} = \left(\hat{\mu} + \gamma_M \hat{\phi}_M \right)$ in equation (16) measures changes in market power in the case of consumer prices which is a combination of markups, and an interaction of markdowns with services sector costs. On the other hand, the term $b_{0H} = \gamma_H^{-1} \left(\gamma_M \hat{\phi}_M - \gamma_H \hat{\phi}_H \right)$ in equation (17) measures changes in market power in case of producer prices and is a combination of markdown and services sector cost interactions. The share of imports in total marginal cost for intermediaries, $b_{1c} = \gamma_M$, provides a proxy for the pass-through rate in the case of consumer prices, while a measure for the pass-through for producer prices is provided by $b_{1H} = \gamma_H^{-1} \gamma_M$ which are cost share differences.

In what follows, we first present results for aggregate consumer and producer pass-through rates, and changes in aggregate consumer and producer market spreads. Next we discuss results on country level changes in pass-through. In the following section we provide a decomposition of the the pass-through into tariff, exchange rate, and price pass-through, and the final section provides a robustness test using a different measure for producer prices.

3.3 aggregate results

In this section we focus on consumer and producer price pass-through rates as well as changes in the market spread terms in equations (16) and (17). Table 1 presents these results. All the specifications presented in the table include country-product specific fixed effects. The first four columns (column A-D) presents results using seemingly unrelated regression, the following two columns (E and F) show the results using fixed effects linear regression allowing for the disturbance term to be first-order autoregressive. Finally the

last two columns (G and H) presents results using seemingly unrelated regression methods using a data with differences of first and last year of the dataset (difference between 2006 and 1996). For each specification the first equation is for the consumer prices and the second is for producer prices.

In columns A and B the results for our basic specification are presented, including only the import price along the country-product fixed effects in the regressions. Based on this specification we find a 7% pass-through from import prices to consumer prices, while a much higher, 24% pass-through to producer prices. Equations (16) and (17) define changes in consumer and producer prices being driven by changes in import prices and also changes in market power and service cost margins. Furthermore, these equations also tell us that the pass-through rate is also influenced by competition in the retail sector. In particular, Observations 2-4 stress the combined effect of oligoposony and oligopoly power. Thus changes in the level of competition in the distribution sector will have a direct effect on both consumer and producer prices and also an indirect effect through influencing the pass-through rate. To assess this effect, the remaining specifications include an instrument for changes in distribution sector price-cost spreads using an index from the OECD measuring the level of competitiveness in the retail sector. Furthermore, an interaction term between the import price and the index measuring competition is also included in the regressions.

The results shown in column C and D are in line with the results presented in the first two columns with the pass-through coefficients both for producer and consumer prices being close to those in the first two columns of the table. The coefficient of the entry variable indicates that in markets with higher market power of retailers consumer and producer prices will be higher (a higher value of the index indicates a lower level of competition in the retailing sector). The coefficient of the interaction term is significant and negative in all specifications, being always higher for producer pass-through. This indicates that as the level of competition decreases (which is measured by increasing values of the 'entry' variable), the pass-through rate will decrease. The results presented in column E-F and G-H are in line with those presented in column C-D, the consumer pass-through being in the range of 6-7% and the producer pass-through being around 26%.

3.4 results by country

We next turn to our estimates of country level pass-through coefficients. Table 2 shows estimated pass-through rates for different countries. Like other recent studies (e.g. Campa et al 2005), we find that the levels of pass-through differ greatly across countries. Figure 2 depicts the estimated consumer pass-through rates (corresponding to b_1 in equation 16 and 17.)

While there are important differences between countries, the producer pass-through rates are always

considerably higher than the consumer price pass-through rates. This finding is comparable to the results from previous studies (e.g. Feinberg 2008; Hellerstein 2006; Gaulier et al 2008). The pass-through from import prices to consumer prices ranges from no significant pass-through to 17%, while the highest pass-through for producer prices is 40%. The producer pass-through rates are significant for all countries except for Benelux. On the other hand, consumer pass-through is not significant for three countries in our sample. Germany has the highest producer pass-through with 40% correspondence between import prices and producer prices. Countries with the lower producer pass-through rate are Austria, France, Italy, and Portugal, with the pass-through rates ranging from 12.5% to 17.8%. The pass-through rates for consumer prices are lower in all the countries than producer pass-through rates; with the highest being in Ireland with 17%. As highlighted in the discussion regarding Observations 1 and 3 above, the magnitude of pass-through depends on cost share differences and the service sector cost component. The estimated differences in pass-through rates between countries are likely to be due partly to important differences in service sector costs and market power of retailers vis-à-vis domestic and foreign suppliers.

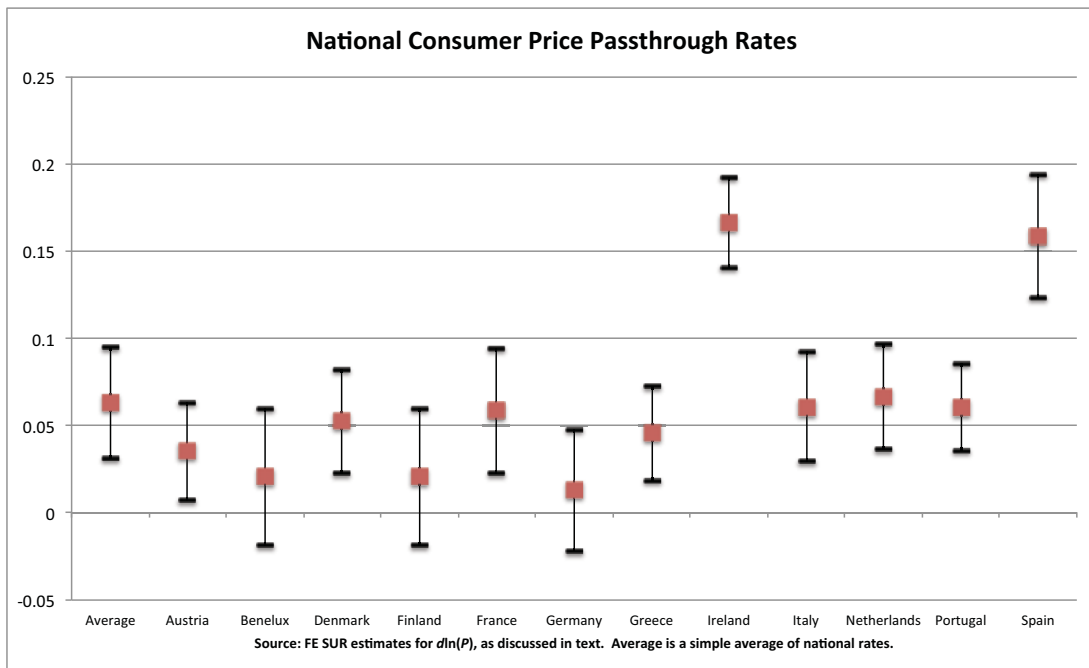


Figure 2: Changes in pass-through at aggregate level over the period 1996-2006

3.5 disentangling different channels

Until now we have not discussed the different channels to which pass-through is attributable to. Pass-through could be driven by price movements, changes in tariffs, or changes in exchange rate among others. In this section we disentangle the pass-through into three main different channels; into price pass-through, exchange rate pass-through, and tariff pass-through.

Table 3 presents three different specifications. In column A and B, our main specification is replicated and presented along with a specification where tariffs, exchange rates and import prices are separate. Both specification presented in the table are based on a sample taking the difference between the first and the last year or the data.

The pass-through from exchange rate over the period is insignificant (see column C and D of Table 3). The most significant pass-through comes from import prices. Tariffs have also have an important impact for consumer prices, while not being significant for producer prices. ADD MAYBE A BIT MORE HERE

3.6 robustness

In the previous sections we constructed a producer price index taking advantage of the existence of the EU internal market by using intra-EU import unit-values as a proxy for the producer price. This proxy for producer prices was used as there is no available producer price index at such disaggregated level. In this section we aim to provide some robustness test for our proxy of producer prices.

At aggregate level, data are available from Eurostat for producer, consumer, and import prices. We use these aggregate data to provide a robustness test for our producer price index. Producer prices at aggregate level are available for durables, non-durables, and agricultural products. We only use the sample with non-durable goods as durable and agricultural aggregation contains products not destined for consumption, thus not comparable to our measure. The producer price indexes from Eurostat include a lot of industrial intermediates, whereas we have filtered these at HS6 level. In addition, we have a deeper sample. So here we compare non-durables, where the inclusion of heavy industrial goods will be less of a problem. Because the Eurostat sample is smaller, the comparison involves just a few countries. We have restricted the sample to where the same observations cover both time series (Eurostat and ours). Also we use Eurostat import price indexes for both regressions (prone to the same composition problems as the PPI). Hence we are comparing strictly the two sets of PPI estimates for non-durables as we think these are reasonably close in terms of covering consumer goods.

Table 4 shows these results. Two specifications are presented in the table. The first includes the price pass-through and a time trend, while the second also includes country fixed effects. For each specification, the second column shows the pass-through for our constructed producer price index, while the third column shows the pass-through for actual producer price index obtained from Eurostat.

The producer price pass-through is higher than the consumer price pass-through which is in line with our previous results. Most importantly, the producer pass-through using the Eurostat producer price index is not significantly different from our constructed producer price index as the t-test has confirmed (the results of the t-test are presented in the last rows of the table).

4 Summary

Our goal in this paper has been to explore the joint interplay between consumer prices and openness, between producer prices and openness, and between consumer and producer prices in Europe. We depart from the recent literature on pass-through at the sector level by focusing jointly on both producer and consumer prices, and by stressing border prices linked to (essentially structural) changes in trade costs like tariffs, rather than to exchange rate fluctuations. The approach taken has been macroeconomic, focusing on evidence at the level of industry aggregates rather than at the firm level.

In the paper, we have developed a theoretical framework in which the trade and distribution sector exercises market power (oligopoly) vis-à-vis consumers and also vis-à-vis domestic and foreign suppliers of goods (oligopsony). Within this framework, a double margin mechanism links border prices to consumer prices and competing producer prices. This mechanism is a function of varying degrees of oligopoly and oligopsony power and allows us to gain insights about how changes in import protection will change market power and thus pass-through to prices. Using this framework, we have estimated pass-through rates and changes in market power for euro-zone countries over the period 1996-2006. We have quantified the transmission of border price changes from both tariff changes and exchange rate movements into both European producer prices and consumer prices. Results indicate a higher pass-through from import prices to producer prices compared to pass-through rates from import prices to consumer prices. The highest pass-through rates for producer prices were found for Germany (40%) while for the Benelux countries no significant pass-through rate was found. These differences in pass-through rates imply significant differences in market structures.

References

- ACEMOGLU, D., S. JOHNSON, AND J.A. ROBINSON. (2001). "The Colonial Origins of Comparative Development: An Empirical Investigation." *American Economic Review* 9(5): 1369-1401.
- ALFARO, L. (2005). "Inflation, openness, and exchange-rate regimes: The quest for short-term commitment." *Journal of International Economics* 77: 229-249.
- BEKKERS, E., J.F. FRANCOIS AND M. MANCHIN (2012). "Importer Prices, Income, and Income Inequality." *European Economic Review* 56(4): 848-869.
- BERMAN, N., P. MARTIN AND T. MAYER. (2009). "How do Different Exporters React to Exchange Rate Changes? Theory, Empirics and Aggregate Implications." CEPR working paper No 7493.
- BETTS, C. M. AND T.J. KEHOE (2006). "U.S. real exchange rate fluctuations and relative price fluctuations." *Journal of Monetary Economics* 73: 1297-1326.
- BLONINGEN, B. A. AND S. E. HAYNES (2002). "Antidumping Investigations of the Pass-Through of Antidumping Duties and Exchange Rates." *American Economic Review* 92(4): 1044-1061.
- BOYLAUD, O. AND G. NICOLETTI (2001). "Regulatory reform in retail distribution." OECD Economic Studies No. 32.
- BURSTEIN, A.T., J.C. NEVES AND S. REBELO (2003). "Distribution costs and real exchange rate dynamics during exchange-rate-based stabilizations." *Journal of Monetary Economics* 50: 1189-1214.
- CAMPA, J. M. AND L. S. GOLDBERG (2005). "Exchange Rate Pass-Through into Import Prices." *The Review of Economics and Statistics* 87: 679-690.
- CAMPA, J. M., L. S. GOLDBERG AND J. M. GONZALEZ-MINGUEZ (2005). "Exchange Rate Pass-Through to Import Prices in the Euro Area." Federal Reserve Bank of New York Staff Report No. 219.
- CAMPA, J. M. AND L. S. GOLDBERG (2006). "Distribution Margins, Imported Inputs and the insensitivity of the CPI to Exchange Rates." mimeo Federal Reserve Bank of New York.
- CONWAY, P. AND G. NICOLETTI (2005). "Product Market Regulation in the Non-Manufacturing Sectors of OECD Countries: Measurement and Highlights." OECD Economics Department Working Paper, No 530.
- CORSETTI, G. AND L. DEDOLA (2005). "A macroeconomic model of international price discrimination." *Journal of International Economics* 67:129-155.
- DESTEFANO, M. (2003). "Exchange Rate Pass-Through in the Italian Car Market." Mimeo Boston University.
- DEVEREUX, M. B. C. ENGEL AND C. TILLE (2002). "Exchange Rate Pass-through and the Welfare Effects of the Euro." *International Economic Review* 44: 223-242.
- DORNBUSCH, R. (1987). "Exchange Rates and Prices." *American Economic Review* 97: 93-106.
- FEENSTRA R. C. (1987). "Symmetric Pass-Through of Tariffs and Exchange Rates under Imperfect Competition: An Empirical Test." NBER Working Paper No. 2453.
- FEENSTRA R. C. (1992). "How Costly is Protectionism." *Journal of Economic Perspectives* 6:159-178.
- FEENSTRA, R.C., J. E. GAGNON AND M.M. KNETTER (1996). "Market share and exchange rate pass-through in world automobile trade." *Journal of International Economics* 40: 187-207.
- FEENSTRA R. C. AND J. D. KENDALL (1997). "Pass-through of exchange rates and purchasing power parity." *Journal of International Economics* 43:237-261.

- FEINBERG, R. (1986). "The Interaction of Foreign Exchange and Market Power Effects on German Domestic Prices." *Journal of Industrial Economics* 35:61-70.
- FEINBERG, R. (1989). "The Effects of Foreign Exchange Movements on U.S. Domestic Prices." *Review of Economics and Statistics* 71:505-511.
- FEINBERG, R. (1989). "The Choice of Exchange-rate Index and Domestic Price Pass- Through." *Journal of Industrial Economics* 39:409-420.
- FEINBERG R. M. AND S. KAPLAN (1992). "The Response of Domestic Prices to Expected Exchange Rates." *Journal of Business* 65(2): 267-280.
- FEINBERG, R. (1989). "A Simultaneous Analysis of Exchange-Rate Passthrough into Prices of Imperfectly Substitutable Domestic and Import Goods." *International Review of Economics and Finance* 5:4 407-416.
- FEINBERG, R. (1989). "Import price effects on retail prices in the US and abroad: two cases." *Economics Bulletin* 13: 1-7.
- FITZGERALD, D. (1989). "Can trade costs explain why exchange rate volatility does not feed into consumer prices?" *Journal of Monetary Economics* 55: 606- 628.
- FRANCOIS, J.F. AND B. HOEKMAN (2010). "Trade and Policy in Services." *Journal of Economic Literature* forthcoming.
- FRANCOIS, J.F., M. MANCHIN, H. NORBERG, AND D. SPINANGER (2007). "Impacts Of Textiles And Clothing Sectors Liberalisation On Prices." Final Report 2007-04-18, Commission of the European Union - Directorate-General for Trade.
- FRANCOIS, J.F. AND J. WOERZ (2009). "Non-Linear Panel Estimation of Import Quotas: the evolution of quota premiums under the ATC." *Journal of International Economics* 78(2): 181-191.
- FRANCOIS, J AND I. WOOTON (2001). "Trade in International Transport Services: The Role of Competition." *Review of International Economics* 9(2): 249- 261.
- FRANCOIS, J AND I. WOOTON (2010). "Market Structure and Market Access." *World Economy* forthcoming.
- GAULIER G., A. LAHRÉCHE-RÉVIL AND I. MÉJAN (2008). "Exchange-rate pass through at the product level." *Canadian Journal of Economics* 41(2):425-449.
- GOLDBERG, P. K. AND KNETTER, M. M. (1997). "Goods Prices and Exchange Rates: What Have We Learned?" *Journal of Economic Literature* 35: 1243-1272.
- GOPINATH, G AND O. ITSKHOKI (2008). "Frequency of Price Adjustment and Pass-Through." NBER working paper No. 14200.
- GRUBEN, W.C. AND MCLEOD, D. (2004). "The Openness- Inflation Puzzle Revisited." *Applied Economics Letters* 11: 465-468.
- GUST, C AND N. SHEETS (2007). "International Finance Discussion Papers." Board of Governors of the Federal Reserve System, No. 850.
- HELLERSTEIN, R. (2006). "A Decomposition of the Sources of Incomplete Cross-Border Transmission." Federal Reserve Bank of New York Staff Reports, No. 250.
- HENDERSON, D. W. (2002). "Comment on: Openness, imperfect exchange rate pass-through and monetary policy." *Journal of Monetary Economics* 49:983-988.
- HUMMELS, D., V. LUGOVSKYY (2009). "International Pricing in a Generalized Model of Ideal Variety." *Journal of Money, Credit and Banking* 41(1): 3-33.

- IHRIG, J.E., M. MARAZZI AND A.D. ROTHENBERG (2006). "Exchange-Rate Pass-Through in the G-7 Countries." International Finance Discussion Papers, Board of Governors of the Federal Reserve System, No. 851.
- MISHKIN, F.S. (2008). "Exchange Rate Pass-through and Monetary Policy. "NBER Working Paper No.13889.
- NAKAMURA, E. (2008). "Pass-through in Retail and Wholesale. "NBER Working Paper No. 13965.
- PARSLEY D. AND WEI, S.J. (2003). "A Prism Into the PPP-Puzzle: The Micro-Foundations of the Big Mac Real Exchange Rates. "NBER working paper No. 10074.
- RICHARDSON, M. (2004). "Trade Policy and Access to Retail Distribution. " *Review of International Economics* 12: 676-688.
- RAFF, H AND N. SCHMITT (2008). "Buyer Power in International Markets. "Kiel Working Paper No.1431.
- RAFF, H AND N. SCHMITT (2008). "International Trade with Heterogeneous Retailers. "Mimeo- presented at the 2008 ETSG Conference in Warsaw.
- ROMER, D. (1993). "Openness and Inflation: Theory and Evidence. " *Quarterly Journal of Economics* 108: 869-903.
- ROMER, D. (1998). "A New Assessment of Openness and Inflation: Reply. " *Quarterly Journal of Economics* 113: 641-648.
- SCHOTT, PETER K. (2004). "Across-Product Versus Within-Product Specialization in International Trade." *Quarterly Journal of Economics* 119 (2): 647-678.
- TAYLOR, J. B. (2000). "Low inflation, pass-through, and the pricing power of firms. " *European Economic Review* 44: 1389-1408.
- ZELLNER, A. (1962). "An efficient method of estimating seemingly unrelated regressions and tests for aggregation bias. " *Journal of the American Statistical Association* 57: 348-368.
- YANG, J. (1997). "Exchange Rate Pass-Through in U.S. Manufacturing Industries. " *Review of Economics and Statistics* 79: 95-104.

Table 1: Border prices and internal prices, all consumer goods

	FE SUR $dln(p)$				FE w/ AR(1) corr $dln(p)$		FE SUR $\Delta ln(p)$	
	$ln(P_c)$ A	$ln(P_h)$ B	$ln(P_c)$ C	$ln(P_h)$ D	$ln(P_c)^1$ E	$ln(P_h)$ F	$ln(P_c)$ G	$ln(P_h)$ H
$ln(P_m)$	0.066*** (0.0046)	0.237*** (0.0158)	0.071*** (0.0070)	0.270*** (0.0246)	0.056*** (0.0057)	0.264*** (0.0292)	0.070*** (0.0256)	0.258*** (0.0893)
$ln(entry)$			0.149*** (0.0295)	0.364*** (0.103)	0.240*** (0.0249)	0.471*** (0.122)	0.036*** (0.0121)	0.131*** (0.0421)
$ln(P_m) \times ln(entry)$			-0.020*** (0.0065)	-0.061*** (0.0228)	-0.033*** (0.0054)	-0.080*** (0.0269)	-0.063*** (0.0197)	-0.124* (0.0688)
Observations	3,044		2,739		2,739		305	
χ^2, F	5105.88	3590.97	5447.39	3654.85	F:79.59	F:53.84	862.94	224.67
$Pr(\chi^2, F > 0)$	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 2: National pass-through $d\ln(P)$

	$\ln(P_c)$ A	$\ln(P_h)$ B
Austria	0.0355** (0.0144)	0.125** (0.0493)
Benelux	0.0206 (0.0202)	0.0632 (0.0693)
Denmark	.05245*** (.01518)	.3051*** (.0530)
Finland	0.000193 (0.0177)	0.229*** (0.0606)
France	0.0586*** (0.0184)	0.133** (0.0631)
Germany	0.0131 (0.0178)	0.397*** (0.0612)
Greece	0.0457*** (0.0138)	0.286*** (0.0475)
Ireland	0.166*** (0.0132)	0.236*** (0.0454)
Italy	0.0609*** (0.0160)	0.175*** (0.0550)
Netherlands	0.0666*** (0.0155)	0.378*** (0.0531)
Portugal	0.0603*** (0.0128)	0.178*** (0.0439)
Spain	0.158*** (0.0180)	0.318*** (0.0619)
Observations		3,044
χ^2	4,987.85	3,676.23
$Pr > 0$	0.000	0.000

Regressions include country-product fixed effects which are omitted from the table.

Standard errors are reported in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

FE SUR regressions, all consumer goods.

Table 3: Landed and *c.i.f.* prices, all consumer goods

	FE SUR $\Delta \ln(p)$		FE SUR $\Delta \ln(p)$	
	$\ln(P_c)$ A	$\ln(P_h)$ B	$\ln(P_c)$ C	$\ln(P_h)$ D
lnPmET	0.116*** (0.0238)	0.237*** (0.0804)		
lnPmETentry	-0.0956*** (0.0170)	-0.102* (0.0576)		
lentry	0.0214** (0.00912)	0.0981*** (0.0308)	0.0245*** (0.00946)	0.114*** (0.0320)
lnPm			0.107*** (0.0247)	0.204** (0.0836)
ln_T			0.769** (0.382)	0.226 (1.292)
lner			0.0834 (0.573)	2.889 (1.937)
lnPmentry			-0.0895*** (0.0189)	-0.0637 (0.0640)
lnerentry			-0.0744 (0.357)	-1.871 (1.205)
ln_Tentry			-0.200 (0.188)	-0.296 (0.634)
Constant	-0.0776 (0.0493)	-0.633*** (0.118)	-0.249*** (0.0365)	-0.588*** (0.123)
Observations	305	305	305	305
R-squared	0.707	0.393	0.710	0.400

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: **Robustness check with Eurostat PPI data. Pass-through for Consumer Non-Durable Goods, $d\ln(P)$**

	iterated SUR			iterated SUR, fixed effects		
	CPI $\ln(P_c)$	unit value $\ln(P_{h1})$	Eurostat $\ln(P_{h2})$	CPI $\ln(P_c)$	unit value $\ln(P_{h1})$	Eurostat $\ln(P_{h2})$
$\ln(P_m)$	0.179*** (0.0661)	1.265** (0.638)	0.832*** (0.0772)	0.210*** (0.0713)	1.045* (0.628)	0.729*** (0.0810)
time	0.0173*** (0.000873)	0.0246*** (0.00843)	0.00930*** (0.00102)	0.0169*** (0.000872)	0.0274*** (0.00767)	0.0103*** (0.000990)
Constant	3.598*** (0.301)	-1.444 (2.902)	0.668* (0.351)	3.459*** (0.326)	-0.494 (2.866)	1.123*** (0.370)
Observations	65	65	65	65	65	65
χ^2	787.86	33.33	544.31	3.58e+06	47291.37	2.801e+06
$Pr(\chi^2 > 0)$	0.000	0.000	0.000	0.000	0.000	0.000
Test if producer pass-through coefficients are equal.						
	χ^2	0.48			0.25	
	Pr > chi2	0.4896			0.6143	

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: Prices $\ln(P_{h1})$ are constructed from unit value data. All other price series are from Eurostat.

Table 5: Annex: Country codes and corresponding country names

Country code	Country name
bx	Belgium-Luxembourg
dk	Denmark
de	Germany
ie	Ireland
gr	Greece
es	Spain
fr	France
it	Italy
nl	Netherlands
at	Austria
pt	Portugal
fi	Finland