International Trade and the Structure of Retail Markets: Evidence from Danish Micro Data

Philipp Meinen\textsuperscript{1}
Deutsche Bundesbank

Horst Raff\textsuperscript{2}
Department of Economics, Kiel University,
Kiel Institute for the World Economy, and CESifo

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Abstract

This paper examines to what extent international trade in consumer goods has contributed to changes in the market conduct of retailers and retail market structure. Based on a theoretical model of the retail sector with heterogeneous firms, we derive hypotheses regarding the effect of direct imports of consumer goods on firm-level sales and mark-ups, on the likelihood of firm exit, on the size and productivity distribution of retailers, and on retail market concentration. We then use Danish micro-data for the period 1999 to 2008 to test these hypotheses. We find that increased trade has statistically significant and economically sizable effects on retail sales and mark-ups, firm exit and retail market concentration.

\textit{JEL} classification: F12, L11
\textit{Keywords}: international trade, retailing, firm heterogeneity

\textsuperscript{1}The views expressed do not necessarily reflect those of the Deutsche Bundesbank.
\textsuperscript{2}Corresponding Author: Department of Economics, Kiel University, 24118 Kiel, Germany, Email: raff@econ-theory.uni-kiel.de
1 Introduction

Consumer good markets in the advanced economies have undergone significant structural change over the last decades, as a growing share of consumer goods are imported and their distribution has become increasingly concentrated in the hands of a small number of big retailers. Retailers have come to dominate consumer goods markets to such an extent that, as Feenstra and Hamilton (2006, p. 233) put it, the manufacturing of consumer goods has become just an "organizational extension of retailing." With much of this manufacturing taking place overseas, the same has to be true for trade in consumer goods.

The growth of import penetration in consumer goods and of retail market concentration are indeed closely connected, as big retailers have become major importers of consumer goods. In the current paper we use Danish microdata for the period 1999 to 2008 to examine this connection empirically, and in particular to determine whether trade liberalization in consumer goods is a cause of structural change in retailing including increased retail market concentration. Our dataset is well suited for this purpose, as it captures the universe of retailers active in Denmark and contains information on firm-level imports and various measures of firm conduct including sales, employment, and profits.

By far the most striking example of a big retailer importing consumer goods is Wal-Mart, which by itself accounts for 6.5% of US retail sales and 15% of US consumer good imports from China (Basker and Van, 2010b).1 A revealing example at the industry level is apparel, where the top 5 retailers, Wal-Mart among them, account for 68% of US sales, with the 29 largest retailers making up 98% of sales (Gereffi and Memedovic, 2004). Import penetration in the US apparel market is around 94%, and direct imports by retailers (in textiles and clothing; HS 50-63) account for 31% of total US apparel imports. The US footwear market exhibits a similar pattern of market concentration, with import penetration at 85% and retailers accounting for 34% of total US import value in footwear (HS 64-67) (Gereffi and Frederick, 2010; Bernard et al., 2010b).2 The same picture emerges in other consumer-good industries and countries.3

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1To put the import share into perspective notice that in 2013 Wal-Mart imported into the United States 1000 standard containers of merchandise per day, which is more than three times the number it brought into the country in 2001. By comparison Target and Home Depot, the next biggest importing retailers, together also brought in around 1000 standard containers per day (Raff and Schmitt, 2015a).

2Notice that apparel and footwear represent big markets. According to the American Apparel and Footwear Association, US consumers spend $340 billion a year on clothes and shoes, almost double what they spend on new cars ($175 billion) (see https://www.wewear.org/assets/1/16/WeWear.pdf; downloaded July 21, 2014).

3Import penetration in the US is also very big in other consumer good industries such as Dolls/Toys/Games (96.5%) (Raff and Schmitt, 2015a). In Germany and the UK import penetration in apparel is 95%, in France 85%, in Italy 65%, and in Spain 55% (Gereffi and Frederick, 2010). Average import penetration in Textiles, Clothing and Footwear in the OECD stands at 59.4% (Nordas, 2008). Regarding imports by Canadian retailers, Raff and Schmitt (2015a) report that the top 5% of importing retailers account for 76.3% of total Canadian imports of Clothing, Shoes, Jewellery, Luggage and Leather Goods, and for 68.2% of all Canadian imports of Electronics and Appliances.
Bernard et al. (2010a) show that retailers (including firms that engage in both re-
tailing and wholesaling) represent 14% of all US importing firms and account for 9% 
of the total value of imports (60% of the total value of imports from China). More 
to the point, Basker and Van (2010a) find that large US retailers’ marginal propensity 
to import from from less-developed countries was 27 percentage points higher (17 per-
centage points higher in the case of China) than that of smaller retailers, suggesting 
that the larger retailers grew faster than smaller ones at least partly because of cheap 
imports.

While there is thus ample circumstantial evidence of a close link between trade 
and retail market structure and conduct, a causal connection at the firm level between 
greater imports and observed changes in retail markets has not been established yet. 
The current paper is meant to prove and quantify this connection, and to explore 
empirically possible economic mechanisms through which trade may lead to changes in 
retail market conduct and structure. The main mechanism we want to explore builds 
on economies of scale in direct importing. Direct imports involve a large fixed cost, but 
allow retailers to access cheap foreign sources for their goods. Only big retailers can 
afford these costs, whereas smaller retailers, if they have access to imports at all, have 
to rely on more expensive indirect imports via wholesalers. When trade barriers fall the 
big direct importers benefit more than small firms that cannot afford direct imports. 
Big retailers expand sales and gain market share at the expense of small retailers, with 
the smallest retailers exiting the market.

We proceed by constructing a theoretical model of this mechanism along the lines 
of Raff and Schmitt (2012). In the model retailing is a monopolistically competitive 
industry with heterogeneous firms, whose productivity follows a Pareto distribution. 
Fixed costs of direct importing separate retailers into a group of very productive and 
therefore big firms able to pay these costs and a group of less productive firms that can 
only source goods domestically. A reduction in trade costs boosts sales and mark-ups 
of direct importers, but squeezes sales and mark-ups of retailers sourcing domestically. 
The smallest retailers are forced to exit the industry. The model is thus able to trace 
out the effect of trade on retailer conduct and ultimately on retail market structure, as 
measured, for instance, by the Herfindahl index of market concentration.

The main empirical challenge we face is that imports by retailers are obviously 
endogenously determined. Big retailers clearly boost imports. We have to find suitable 
instruments for direct imports so that we can overcome this problem. We do so by 
drawing from insights presented in Hummels et al. (2014), and address the endogeneity 
problems by computing firm-specific, time varying instruments based on a country’s 
world export supply of a specific product and on bilateral exchange rates. We then 
use these instruments to investigate the hypotheses derived from our theoretical model. 
Overall, we find quite convincing support for our theoretical model. For instance, we 
find that an increase in retail firms’ direct international sourcing leads to higher sales,

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4In 2008, retail firms in Denmark accounted for around 15.8% of all firms importing consumer 
goods and 14.5% of total consumer good import values in Denmark. Note that we only identify firms 
as retailers that report the retail sector as their main activity.
markups and profits. Test statistics reveal that our instruments perform well confirming that our IV strategy is suitable in this context. Moreover, regressions concerning the effect of imports on retail market structure suggest that a surge in direct importing at the sector-level is associated with the exit of the least efficient firms and an increase of retail market concentration as measured by the Herfindahl index.

We also explore several complementary hypotheses that have been proposed to explain the effect of trade on market concentration in retailing. In Basker and Van (2010b) market concentration is also driven by economies of scale in direct importing. But market concentration takes the form of chain retailers expanding their number of stores and forcing smaller, single-store competitors to exit. We can examine directly whether increased trade leads firms to expand the number of stores they operate. Indeed, we can confirm this hypothesis which also holds when accounting for the endogeneity in the relationship under investigation using our instrumentation strategy. In Eckel (2009) retail market concentration comes from an increase in the number of varieties available on the world market, because expanding the assortment to include more imported varieties raises fixed retail costs and thus forces firms to exit the market. To test the Eckel hypothesis we construct an instrument for the increase in product varieties available on world markets. In line with the model of Eckel, the estimation results confirm that not only the value of imports matters for retail firm performance, but also the number of varieties imported.

Our paper contributes directly to the literature on trade and retailing that we have already discussed above (see Raff and Schmitt, 2015a, for a survey). Our empirical analysis is most closely related to Basker and Van (2010a), but differs from that paper not only in terms of the theoretical motivation, but also in terms of the organization of the data and in the types of inferences that are drawn. Basker and Van base their study on US import data at the product level. This has the advantage that it captures both direct and indirect imports. However, since they do not observe imports at the firm level, they have to assign imports of a product to segments of the retail market by assuming that the segment’s share of imports is equal to that segment’s share of total retail sales of the product. They go on to divide each segment into several groups (large retailers - based on the share of sales controlled by the four largest retailers), and sources of imports (whether from China, less-developed countries (LDCs), or developed countries). This organization of the data allows them to show a strong correlation between imports and market concentration in retailing, but, unlike our paper, does not allow them to analyze firm behavior at a detailed level or to establish causal effects of trade on retail sales, mark-ups and profits.\(^5\)

The importance of retailing in assessing the welfare effects of trade liberalization in consumer goods markets has been recognized at least indirectly by the literature on exchange-rate pass-through. Campa and Goldberg (2006) argue that distribution margins (i.e., costs of retailing and retailer mark-ups) typically make up 30 to 50 percent

\(^5\)Our paper can also be seen as a complement to other explanations of the evolution of retail market concentration. Basker et al. (2012) highlights the role of technological change as a driving force of market concentration. See also Foster et al. (2015) for a recent survey.
of the retail prices of consumer goods. Thus any change in the productivity distribution and mark-ups in retailing is bound to have a big effect on retail prices and ultimately on social welfare (see also Hellerstein, 2008). Retailing market structure also affects welfare, because it determines retailers’ choice of assortment (Raff and Schmitt, 2015b).

In many consumer good markets it is retail assortments that determine how many product varieties consumers get to choose from, because manufacturers typically do not sell directly to consumers. Also Raff and Schmitt (2009) show that market concentration in retailing and the resulting buyer power of large retailers may limit the welfare gains from trade liberalization. The current paper contributes to this literature at least indirectly by demonstrating that trade liberalization itself may lead to greater market concentration and higher mark-ups in retailing.

The rest of the paper is organized as follows. In the next section we present a simple model of the retail market, in which prices, imports and market structure are endogenously determined. We use this model to generate testable hypotheses about the effect of trade liberalization on retail markets which we present in Section 3. In Section 4 we document the data and provide a systematic account of imports and market structure in retailing for Denmark. The empirical methodology and estimation results related to our model are presented in Section 5, while Section 6 contains additional results related to other theoretical models. Section 7 concludes. Proofs and summary statistics are presented in the appendix.

## 2 The Model

In this section we present a model of the retail market along the lines of Raff and Schmitt (2012) in which retailers decide whether to import goods or to source them domestically. We want to use this model to explain how a reduction in trade barriers influences the decision to import and thereby affects the sales, markups and profits of individual retailers, their likelihood to exit the market, as well as indicators of retail market structure including the number and size distribution of retailers and the Herfindahl index of retail market concentration.

There are \( N \) active retailers located symmetrically on a circle of circumference 1. A measure \( L \) of consumers is uniformly distributed around the circle. Each consumer demands one unit of an aggregate consumption good and faces a linear transport cost \( \tau \) per unit of distance to visit a retailer.

In order to accommodate productivity differences among retailers we require a model, in which each retailer competes not just with its neighbors on the circle, but with all other retailers. We adopt the ‘random preference Hotelling’ specification of Innes (2006), where preferences are random because each ordering of the \( N \) active retailers among the \( N \) locations is possible and happens with the same relative frequency. A simple interpretation of these preferences is that when choosing where to shop a consumer chooses between only two retailers, as in a standard address model, but the identity of the two retailers depends on an unobserved, random event. Innes shows
that the aggregate demand function faced by retailer $i$ is linear in prices such that $q_i(p_i) = \frac{L}{N} - \frac{L}{\tau}p_i + \frac{1}{N-1} \frac{L}{\tau} \sum_{h=1, h \neq i}^{N} p_h$. We make the additional assumption that $N$ is big enough so that demand can be approximated by

$$q_i(p_i) = \frac{L}{N} - \frac{L}{\tau}p_i + \frac{L}{\tau}\bar{p}, \quad (1)$$

where $\bar{p}$ is the average industry price.\(^6\)

Labor is the only factor of production, inelastically supplied. We fix the price of labor in the economy at 1 and express all costs in terms of labor requirements. To enter the market retailers incur a sunk cost $F_E$. After entering, each retailer learns its marginal retail cost $c$ (or productivity $1/c$). The distribution of $c$ is denoted by $G(c)$ with support on $[0, c_M]$. Given the sunk entry cost, only retailers able to cover their marginal cost $c$ are active in the market. All remaining retailers are inactive. We let retail productivity follow a Pareto distribution, so that the cumulative distribution function for $c$ is

$$G(c) = \left(\frac{c}{c_M}\right)^k,$$

with $k \geq 1$.

The structure of the production sector as simple as possible. We assume that the aggregate consumption good is produced at home and abroad by perfectly competitive manufacturing industries. Upon entry a retailer has to decide whether to source goods domestically, for instance, from domestic wholesalers, or to import them directly. Direct imports involve a per-unit trade cost $t$ and a fixed cost $F_I$. This fixed cost includes the cost of maintaining buying offices, cooperating with foreign partners to source goods, acquiring information, etc. For simplicity, we normalize the price at which goods can be bought directly from foreign producers to zero. Purchasing goods domestically is associated with a higher variable cost, $w > t$, but involves no fixed cost.

Hence, active retailers that buy domestically maximize

$$(p_i - c - w)q_i(p_i), \quad (2)$$

whereas active retailers relying on direct imports maximize

$$(p_i - c - t)q_i(p_i) - F_I. \quad (3)$$

Below we let superscript $D$ indicate domestic sourcing, and $I$ indicate direct imports.

Each retailer takes the number of active retailers $N$ and average retail price $\bar{p}$ as given when setting its price. The retail industry is thus monopolistically competitive.

\(^6\)An alternative microfoundation for this demand function is to adopt linear quadratic preferences as in Melitz and Ottaviano (2008). See Raff and Schmitt (2012) for a more detailed discussion of this approach.
Defining \( c_D \equiv \tau / N + \bar{p} - w \), a retailer with marginal cost \( c \) has the following profit-maximizing prices and outputs when buying domestically, respectively importing

\[
p^D(c) = w + \frac{1}{2} [c_D + c]; \\
p'(c) = \frac{1}{2} [c_D + w + c + t]; \\
q^D(c) = \frac{L}{2\tau} (c_D - c); \\
q'(c) = \frac{L}{2\tau} (c_D + w - c - t).
\]  

(4)  

(5)  

(6)  

(7)

Hence \( c_D \) represents the marginal cost at which a retailer sourcing domestically is just indifferent between being active and being inactive, i.e., \( q^D(c_D) = 0 \).

A retailer with marginal cost \( c \) earns profits equal to

\[
\pi^D(c) = \frac{L}{4\tau} (c_D - c)^2 - F_E, \quad \text{or} \\
\pi^I(c) = \frac{L}{4\tau} (c_D + w - c - t)^2 - F_E - F_I,
\]  

(8)  

(9)

Only retailers with marginal costs less than or equal to \( c_D \) will remain active, because only they will be able to cover their marginal cost. Active retailers have to select from which source to buy their goods. A retailer is indifferent between domestic sourcing and direct imports if \( \pi^D(c) = \pi^I(c) \). This condition defines a critical value of the marginal cost \( c_I \),

\[
c_I = c_D + \frac{(w - t)}{2} - \frac{2\tau F_I}{L(w - t)},
\]

(10)

such that firms with \( c \leq c_I \) prefer imports and firms with \( c > c_I \) prefer domestic sourcing. We assume that \( c_I \leq c_D \) so that the least efficient active retailers engage in domestic sourcing. This requires that

\[
\frac{L}{4\tau} (w - t)^2 \leq F_I.
\]

(11)

We also assume that importing is more profitable for the most efficient retailers than domestic sourcing. Thus, for \( c = 0 \), we require

\[
F_I < \frac{L}{4\tau} \left( (w - t)^2 + 2c_D(w - t) \right).
\]

(12)

These two assumptions ensure that the value of \( c_I \) solving (10) is unique.

The two cut-off values of the marginal cost, \( c_D \) and \( c_I \), define three categories of retailers. Retailers whose marginal cost is sufficiently small \( (c \leq c_I) \) import directly; retailers whose marginal costs are in the middle range \( (c_I < c \leq c_D) \) source goods domestically; and retailers with high marginal costs \( (c > c_D) \) are inactive.
Given these cutoffs we can compute the average retail price of active retailers as

\[ \bar{p} = \frac{1}{G(c_D)} \left( \int_{c_I}^{c_D} p^I(c) dG(c) + \int_{c_I}^{c_D} p^D(c) dG(c) \right). \]

(13)

The number of active retailers is then given by

\[ N = \frac{\tau}{(c_D + w - \bar{p})}. \]

(14)

The number of active retailers is related to the number of entrants into the retail market, \( N_E \), by the condition \( N = N_E G(c_D) \). In equilibrium the number of entrants has to be large enough so that the expected profit of a retailer is equal to zero:

\[ \int_0^{c_I} \pi^I(c) dG(c) + \int_{c_I}^{c_D} \pi^D(c) dG(c) + \int_{c_D}^{c_M} (-F_E) dG(c) = 0. \]

(15)

The endogenous variables of the model are \( \bar{p}, c_D, c_I \) and \( N \). The equilibrium values of these variables are given by equations (10), (13), (14) and (15).

3 Testable Predictions

In this section we examine the comparative statics of the model with regard to changes in the trade cost t and formulate corresponding hypotheses; all proofs are in the Appendix. We start with the the zero-profit condition (15), which characterizes the cut-off value \( c_D \). Totally differentiating this condition allows us to compute \( dc_D/dt \); \( dc_I/dt \) can then be obtained from (10). This allows us to formulate the following two hypotheses:

**Hypothesis 1** (Exit) *Trade liberalization forces the least efficient retailers to become inactive.*

**Hypothesis 2** (Extensive Margin) *Trade liberalization induces a larger share of retailers to import directly.*

The intuition for these effects is as follows. A reduction in the trade cost, ceteris paribus, raises the profits of direct importers both in absolute terms and relative to those retailers that source their goods domestically. Hence more retailers will turn to direct imports (\( c_I \) rises). To keep the zero-profit condition satisfied ex ante despite the fact that active retailers will ex post earn a larger profit, \( c_D \) has to decrease so as to lower the probability of being an active retailer.

Retailers that import directly pass only part of the reduction in trade costs on to consumers. Their markups, sales and profits hence rise. Retailers that source their goods domestically are forced to cut their mark-ups, which leads to lower sales and profits. These effects can be summarized as follows:
Hypothesis 3 (Sales, Mark-ups, Profits) Trade liberalization (i) raises the sales, mark-ups and profits of retailers that engage in direct imports; (ii) lowers the sales, mark-ups and profits of retailers that source domestically.

Next we can examine how trade liberalization, by changing the cutoff values and the performance of individual firms, affects aggregate performance measures and the structure of the retail industry. We begin with the average retail price:

Hypothesis 4 (Average Retail Price) Trade liberalization reduces the average retail price.

We can use (14) to derive how the number of active firms $N$ changes with marginal changes in $t$. There are two effects. First, a reduction in $t$ reduces the average retail price. This price effect tends to reduce the number of active retailers. Second, a decrease in $t$ reduces $c_D$. This selection effect means that retailers on average become more efficient. This tends to increase the number of active retailers. The sign of $\frac{dN}{dt}$ is therefore generally ambiguous. The traditional price effect dominates if the fixed cost of importing is not too big. Hence we can formulate:

Hypothesis 5 (Number of Active Retailers) Trade liberalization reduces the number of active retailers if the fixed cost of importing is sufficiently small.

For the average sales of active firms and the variance of sales we obtain:

Hypothesis 6 (Mean and Variance of Retail Sales) Trade liberalization raises the mean and reduces the variance of retail sales if the fixed cost of importing is sufficiently small.

The Herfindahl index, $H$, is an ideal measure of market concentration in markets with heterogeneous firms. This is because this index takes into account the entire size distribution of the firms in the industry and thus both the number of active firms as well as the variance of firm size. Indeed, the Herfindahl index can be written as

$$H = \frac{\sigma_q^2 / \bar{q}^2 + 1}{N},$$

where $\bar{q}$ denotes average sales of active firms and $\sigma_q^2$ is the variance of sales (see Waterson, 1984). Thus, in a market with heterogeneous retailers, retail market concentration is negatively related to the number of active retailers, $N$, and positively related to the coefficient of variation of retail sales, $\sigma_q / \bar{q}$. Since $0 \leq H \leq 1$, industry concentration is high if a few big retailers account for a large fraction of sales. We find:

Hypothesis 7 (Herfindahl Index) Trade liberalization raises the Herfindahl Index of market concentration if the fixed cost of importing is sufficiently small and the number of active retailers is sufficiently big.
4 Data

4.1 Data Sources

To test the predictions of our theoretical model, we use data on retail firms present in Denmark between 1999 and 2008. Specifically, we make use of three data sets available from Statistics Denmark. First, the data set *FIRM* (“Generel Firmastatistik”) contains the population of firms active in Denmark and includes information on industry affiliations, number of employees in full-time equivalents (FTEs) and other firm characteristics such as turnover, value added, profits, fixed and total assets. We deflate firm-level variables such as turnover using the consumer price index with 2000 as base year. Second, we use the data set *UHDI* (“Udenrigshandel diskretioneret”) which provides information on firms’ export and import activities at detailed product level and by partner country. The data come from two sources: Intrastat (for trade among EU member states) and Extrastat (for trade with a country outside the EU). Extrastat data come from custom forms and tax authorities and cover nearly all trade while Intrastat data are self-reported figures by Danish firms that exceed certain export and import thresholds following the EU regulation. Third, the data set *IDAS* (“IDA arbejdsstede”) contains certain plant-level information for each firm. Since in the case of retail firms a plant corresponds to a shop, we use this data set to compute the number of shops by firm. Thanks to a unique firm identifier, we can merge the information present in each of the mentioned data sets.

Table A.1 in the appendix presents summary statistics for variables used in our analysis. Based on the industry affiliation documented in *FIRM*, we retain all firms that report the retail sector as their main activity. We then drop a few sub-sectors from our sample where the mechanisms of interest are less likely to be relevant; that is, we exclude NACE rev. 1 3-digit sectors 522 (retail sale of food, beverages and tobacco in specialized stores), 523 (retail sale of pharmaceutical and medical goods, cosmetic and toilet articles), 525 (retail sale of second-hand goods in stores), 526 (retail sale not in stores), and 527 (repair of personal and household goods). In the following, when using the term retail sector, we refer to the firms included in our analysis.

Statistics Denmark reports the industry affiliation at the 6-digit level where the first four digits correspond to the NACE 4-digit classification. In most cases we use the NACE 4-digit classification in order to define a sector since this appears most appropriate. However, in case of the sector “other retail sale in specialized stores”
(5248), the 4-digit classification is too broad since it masks the large heterogeneity of retail shops belonging to this sector (e.g. jewellery, sports equipment, toys, bikes, electronics). Hence, for this sector we use a more detailed sector definition. Table A.2 in the appendix lists all sectors in our analysis and presents the corresponding sector definitions.

Finally we note that we focus our analysis on imports of consumer goods which we identify based on the BEC classification. Over the sample period, on average consumer goods account for 77% of total imports of our retail firms.

4.2 Descriptive Evidence

Table 1 presents a number of aggregated indicators by year for the firms in our analysis. First, we observe that retail firms account for an important share of firms importing consumer goods and that this share remained relatively constant during the sample period amounting to 13.2% in 1999 and 12.8% in 2008 (column i). Retail firms also matter with respect to the intensive margin of consumer goods imports and this involvement increases over time from 9.4% in 1999 to 13.8% in 2008 (column ii). In indeed, for certain product categories, this share amounts to 20% and more.\footnote{For instance, in 2006 the share of imports of raw hides and skins, leather and articles thereof (HS 41-43) amounted to 20%, the of share imports of wood and articles of wood (HS 44-46) equalled 23%, the of share imports of furniture, toys, and miscellaneous manufacturing articles (HS 94-96) amounted to 33% and the of share of imports of art and antiques (HS 97-99) equalled 39%.

Focussing on the retail sector in the remaining columns of Table 1, we observe that between 1999 and 2008 the involvement in direct importing of retailers increased markedly, both with respect to the intensive and extensive margins. The share of direct imports of consumer goods in total sales in the retail sector increased from 3.7% in 1999 to 7.9% in 2008 and the share of importing firms rose from 7.2% to 11.0%. Moreover, importing firms tended to increase the number of varieties (defined as a HS4-digit product-country combination) of consumer goods that they source from abroad; while in 1999 an importing retailer on average imported 10.5 varieties, in 2008 this number has increased to 13.9. At the same time the number of retail firms remained relatively constant over time while total sales and the number of chain stores\footnote{We refer to a firm as chain if it has more than one shop.} have increased significantly. Moreover, we find some evidence of higher market concentration when looking at the weighted averages of the Herfindahl index and market shares of top 5 firms per sector. Both measures have increased over time indicating an increase in market concentration. The sharp increase of the Herfindahl index in 2005 is caused by the emergence of a new firm in one particular retail segment in that year.

Table 2 contains results from common premia regressions where we regress the log of domestic sales, profits, markups, and number of shops, respectively, on an importing dummy controlling for industry-year effects. As expected, we find that importing firms have significantly larger sales, profits, markups and number of shops than non-importing
firms. These findings are robust to controlling for the number of employees by firm. While these results point to some of the mechanisms highlighted in our theoretical model, they obviously do not allow to draw any causal inferences. Specifically, it is unclear whether we identify a pure selection effect where larger / more profitable / high markup retail firms select into importing since they can bear the fixed costs associated with this activity or whether importing may also cause firms to grow / become more profitable / charge higher markups. In the next section we describe our instrumental variable approach which allows us to investigate this inherently endogenous relationship.

5 Econometric Methodology and Estimation Results

Before describing our estimation strategy, we should point out that we do not have a direct measure for trade liberalization at our disposal. Instead, we investigate how changes in the import behavior at the firm- and sector-level relate to the outcomes of interest. If imports increase over time because importing has become cheaper, changes in actual imports should indeed proxy for trade liberalization. In this context it should be noted that the period under investigation has seen some important changes in world trade associated with reductions in trade costs such as the WTO membership of China and the EU enlargement towards the east.

This empirical part of the paper aims at testing some of the hypotheses stemming from our theoretical model. The analysis can be distinguished into two main parts: first, we investigate the firm-level consequences of direct sourcing described in Hypothesis 3. Thanks to the rich firm-level data at our disposal, these firm-level regressions involve an IV strategy which addresses endogeneity problems. Second, we look at the remaining hypotheses that relate a sector’s direct importing activities to measures of industry structure such as the probability of firm exit and the Herfindahl index. These regressions are meant to verify whether the patterns that emerge from the data are consistent with the theoretical model, but they do not allow us to claim causality.

5.1 Regressions Related to Firm-Level Sales, Mark-Ups and Profits

The baseline model for analyzing within-firm adjustments caused by direct importing activities is the following:

\[
\ln(y_{it}) = \beta_0 + \beta_1 \ln(imp_{it}) + \beta_2 \ln(x_{it}) + \alpha_i + \alpha_s + \alpha_t + \alpha_{st} + \epsilon_{it}.
\]

\(y_{it}\) may refer to domestic sales, profits and markups of firm \(i\) in period \(t\). \(imp_{it}\) is the variable of interest which measure total consumer good imports by firm \(i\) in year \(t\). \(x_{it}\) is a vector containing firm-level control variables. Specifically, we control for labor productivity computed as value added by employee, the size of the firm proxied by the sum of total assets, and the average wage. \(\alpha_i\) is a firm-fixed accounting for time-constant, unobserved heterogeneity; e.g. related to foreign ownership which is
unobserved by us. Note that including firm fixed effects implies that the effects of interest are identified by within firm variation. \( \alpha_s \) are sector dummies which account for persistent differences across our retail sectors and \( \alpha_t \) is a year fixed effect which controls for common yearly shocks to our firms. Finally, \( \alpha_{st} \) are industry-year effects which account for yearly shocks at detailed industry level to the firms in our sample. For instance, these effects may capture changes in indirect sourcing activities at the sectoral level and, importantly, they account for industry specific demand shocks and price developments unobserved by us.

It is important to note that the import variable \( \text{imp}_{it} \) varies at the firm-level, but is potentially endogenous, for instance, because shocks to a firm’s productivity or demand likely affect firm-level outcomes such as sales and firm-level imports simultaneously. Hence, we require sources of exogenous variation in order to identify the causal effect of firms’ international sourcing activities on firm-level outcomes. To this end, we draw from the insights presented in Hummels et al. (2014) who propose an instrument that is correlated with firm-level imports but uncorrelated with firm performance. The instrument ”world export supply” (\( WES \)) is based on country \( c \)’ exports of product \( k \) to all destinations except for Denmark. The idea is that \( WES \) captures changes in the comparative advantage of country \( c \) in producing good \( k \) which affect the desirability of purchasing this variety by Danish firms without directly affecting their performance.

We compute this variable using the BACI data set which contains bilateral, product-level export data. We can aggregate \( WES \) to the firm-year level using the share \( s_{icj} \) of product \( k \) imported from country \( c \) in firm \( i \)’s total imports in the pre-sample period comprising the years 1997 and 1998. In case firms start importing after 1998, we following Hummels et al. (2014) and use the first year of importing as pre-sample. We then obtain a time varying firm-level instrument \( \text{inst}_{it} \) as follows:

\[
\text{inst}_{it} = \sum_{c,j} s_{icj} WES_{cj}.
\]  

Since the relationship between a variety (country-product combination) and a firm is determined in the pre-sample, this relationship should be relatively stable over time so that the instrument is meaningful in consecutive periods. This is one reason why we define a product at the HS4-digit level rather than the HS6-digit level; i.e. a firm-product-country relationship tends to be more stable over time at the HS4-digit level which is an important requirement for the validity of our IV strategy.\(^1\) Specifically, more than 55% of country-product import flows purchased by firms in-sample also appear in the pre-sample period. Further note that in order to have a truly firm-specific instrument, firms should vary in terms of varieties sourced from abroad. Indeed, we observe that a typical (median) variety is imported by only one retail firm in a given year. Thus, taken as given that firm \( i \) intensively sources product \( k \) from country \( c \) for whatever reason, firm \( i \) will be more affected by shocks to the comparative advantage

\(^{12}\)Another important reasons is that the HS6-digit product codes are affected by changes of product code definitions over time while the HS4-digit product codes are very stable over time.
of country $c$ concerning product $k$ than other firms implying that we have a relevant instrument.\textsuperscript{13} Besides world export supply, we also compute an instrument based on the bilateral exchange rate.\textsuperscript{14} The argument for this instrument is similar while it should be noted that it captures country-level variation only, in contrast to $WES$ which rests on country-product variation.

It is important to note that we can use this instrument only to investigate firms that already import. This is because the instrument is based on the pre-sample shares $s_{i,c,k}$. Hence, we cannot investigate the effect of discrete changes in import status on retail firms’ performance. This is, however, not a problem with respect to Hypothesis 3 that we want to test, since the hypothesis is explicitly formulated for importing firms. Moreover, we note again that, in line with Hummels et al., we do allow for entry into importing.

We now turn to results. The first two columns of Table 3 present results for domestic sales. First of all, OLS estimates in column (i) show a positive and significant effect of increased firm-level importing on domestic sales which is in line with Hypothesis 3 of our model. IV results in column (ii) confirm this finding while suggesting that OLS estimates are slightly downward biased; i.e., the effect of interest increases from 4.5% to 7.1%. Hence, we do not only find a statistically significant effect, but also an economically relevant one. The test statistics for our instruments confirm their validity and strength. The control variables suggest that increases in productivity and firm size positively impact firm sales. Moreover, we find a positive relationship between average wage per employee and firm sales which may suggest that increases in the average quality of employees raises firm-level sales. However, we do not intend to make causal interpretations with respect to our control variables since there certainly are endogeneity problems related to them. Such endogeneity concerns are less of a problem for us since we merely aim at controlling for firm-level adjustments which my impair identification of the effect of interest if such controls were omitted. Furthermore, in linear models such as ours, the endogeneity of one regressor does not affect the identification of other variables. Generally, we interpret the effects of the control variables as indicating equilibrium relationships in the data without taking a stand on causality.

In columns (iii) and (iv) of Table 3 we analyze the effect of direct importing on firm-level profits before taxes. Since we take the log of profits, we only consider firms with positive profits.\textsuperscript{15} OLS results suggest a positive and significant effect of importing on firm-level profits. These effects are confirmed by IV estimations while the coefficient magnitudes again increase somewhat; from around 5.7% to 10.9%. The test statistics for our instruments again show their good performance. Moreover, the control variables suggest equilibrium relationships in line with economic theory; while increases in productivity and size are associated with higher profits, increases in average wage per employee tend to lower them.

\textsuperscript{13}For instance, Danish consumers may value this particular product from the source country or the Danish firm has a long-standing relationship with the exporting firm abroad (Hummels et al., 2014).

\textsuperscript{14}Hummels et al. also use exchange rate in the working paper version of their paper.

\textsuperscript{15}9% of firms that report profits have zero of negative profits in our sample.
Finally, we turn to the regressions with firm-level markups as dependent variable. We follow the methodology of De Loecker and Warzynski (2012) to estimate firm-level markups which builds on insights from Hall (1988) and relies on fairly modest assumptions; specifically, the approach rests on the assumptions of cost minimizing firms and the presence of at least one variable input that is free of adjustment costs. The methodology does not depend on a particular type of competition or functional form of demand and it accommodates a variety of (static) price setting models. Specifically, firm-level markups $\mu_{it}$ are obtained from the following relationship

$$
\mu_{it} = \frac{\varepsilon_{it}^X}{\alpha_{it}^X},
$$

where $\alpha_{it}^X$ is the share of input $X$ in total output of firm $i$ and $\varepsilon_{it}^X$ represents the output elasticity of input $X$. $\alpha_{it}$ is directly observable in our data so that we only require an estimate of $\varepsilon_{it}^X$ to obtain $\mu_{it}$. We closely follow De Loecker and Warzynski (2012) in the empirical implementation and obtain $\varepsilon_{it}^X$ by estimating a translog value added production and using the output elasticity of labor to recover firm-level markups. Given the highly flexible labor market in Denmark, considering labor as the variable input that is free of adjustment costs appears reasonable. We estimate the production function using a control function approach to deal with simultaneity problems related to unobserved productivity shocks. Specifically, we follow the insights by Ackerberg, Caves and Frazer (2006) while relying on material inputs to proxy for unobserved productivity as suggested by Levinsohn and Petrin (2003). The approach involves estimating the output elasticities using GMM techniques with the identifying assumption that productivity follows a first order Markov process.\(^{16}\)

The results for the markup regressions are provided in columns (v) and (vi) of Table 3. Since markups are estimated and it is difficult to judge their adequacy due to a missing benchmark, it is particularly interesting to look at the equilibrium relationships implied by our control variables in order to assess their accordance with economic theory. Indeed, as expected, we find a positive relationship between markups and productivity and a negative relationship between markups and average wages which likely capture changes related to marginal production costs. The relationship between changes in size and changes in markups is less obvious theoretically; here, we find a negative relationship. Turning to the variable of interest, we find that higher firm-level imports are associated with higher markups. IV results again confirm these findings while the estimated effects are somewhat smaller amounting 1.2% in case of OLS and 1.9% in case of IV. As before, we find that our instruments perform well. Thus, the estimation results presented in Table 3 confirm Hypothesis 3 quite convincingly.

\(^{16}\)Table A.1 in the appendix presents summary statistics for $\mu_{it}$. Median markups of retail firms amount to 1.14 while the table displays a considerable degree of heterogeneity of markups across firms. Table A.3 in the appendix presents estimates of the median output elasticities and markups by aggregated retail sector. Note that we estimated the production function separately for each of the sectors presented in that table.
5.2 Regressions Related to Market Structure

We now turn to the other hypotheses derived from our theoretical model. In particular, we want to verify whether the mechanism described by the model through which imports affect retail market structure is consistent with the data. The first set of regressions we run concerns the relationship between the probability of firm exit and direct international sourcing. To this end we estimate the following model

\[
exit_{it} = \beta_0 + \beta_1 \ln(imp_{st}) + \beta_2 \text{dsize}_{it} + \beta_3 \text{intera} + \beta_4 \text{dimp}_{it} + \alpha_s + \alpha_t + \epsilon_{it},
\]  

(20)

where \(exit_{it}\) is a dummy variable which equals unity when a firm resigns from the market,\(^\text{17}\) \(\text{dimp}_{it}\) is a dummy variable controlling for direct sourcing of firms, \(\ln(imp_{st})\) are total direct consumer goods imports of sector \(s\) at time \(t\), \(\text{dsize}_{it}\) is a categorical variable indicating the smallest / least efficient firms in a given year and \(\text{intera}\) is an interaction term between \(\ln(imp_{st})\) and \(\text{dsize}_{it}\).\(^\text{18}\) Hence equation 20 allows us to investigate whether increased sourcing at the sector-level raises the probability of exit of inefficient/small firms as suggested by Hypothesis 1. We estimate the equation as a linear probability model since this facilitates the interpretation of the interaction term.

The estimation results in Table 4 indicate that retail firms that directly source from abroad have a lower probability of exiting the market. Moreover, we find that small firms have a higher probability of exiting the market and that this probability is increasing in sector-level direct imports as indicated by the positive and significant interaction term. We set the cutoff for belonging to the group of smallest firms to the 10th percentile. We compute this percentile on a yearly basis both over all retail firms and by retail sector. The results are robust to changing the size threshold to the 20th or 5th percentiles (columns iii to vi). Hence, these results indeed suggest a relationship between increased sectoral retail imports and the probability of exit of the least efficient / smallest firms as suggested by Hypothesis 1.

Second, we estimate sector-level regressions where the dependent variable, \(y_{st}\), is the share of importing firms, the Herfindahl index or components of the Herfinadahl index in sector \(s\) at time \(t\). Our estimation equation is

\[
\ln(y_{st}) = \beta_0 + \beta_1 \ln(imp_{st}) + \beta_2 \ln(sales_{st}) + \alpha_s + \alpha_t + \epsilon_{it},
\]  

(21)

where \((sales_{st})\) are total sales of sector \(s\). By controlling for sector fixed effects in these

\(^{17}\)Thanks to a variable indicating the resign date of a firm, we can identify exits in the data. However, there are a number of firms leaving the market for which the resign date variable is not reported. Since it is not clear what exactly happens to these firms, we exclude them from the estimation sample when investigating the probability of firm exit.

\(^{18}\)We proxy for efficiency using firms’ total domestic sales which is an obvious indicator for the size of a firm which in turn is highly correlated with productivity as documented in numerous studies. Moreover, our theoretical model suggests a direct link between size and productivity. This variable is our preferred proxy for efficiency here because several firms do not report any employees so that labor productivity cannot be computed for these firms. Since these firms are often small and tend to exit the market rather frequently, we lose important information when relying on labor productivity.
sector-level regressions, we exploit within sector variation to identify the effect of direct importing on the outcome of interest.\footnote{Note that the sector-level in these regressions is always the NACE 4-digit level. We aggregate the sub-sectors of sector 5248 to this level by computing the simple average across all sub-sectors.}

Table 5 contains the estimation results. As Hypothesis 2 suggests we find that an increase in sector-level direct imports is positively related with a larger share of importing firms in a sector (column i). Due to the lack of adequate price data, we cannot assess Hypothesis 4. But we are able to examine the effect of a rise in direct sector-level imports on the Herfindahl index of industry concentration and its constituent parts, specifically the number of retailers, as well as the mean and variance of retail sales.

In line with Hypothesis 7, we find in column (ii) that a rise in direct sector-level imports is indeed associated with an increase in the sector’s Herfindahl index and thus a rise in market concentration. However, when it comes to the components of the Herfindahl index we obtain mixed results. We do not find a significant relationship between the number of firms and sector-level imports as proposed in Hypothesis 5 (column iii) and, similarly, no significant effects are found for average sales and the variance of sales by sector as suggested by Hypothesis 6. While our results thus do not support Hypotheses 5 and 6, it is important to recall that the theoretical model itself does not deliver clear cut predictions regarding the effect of imports on the number of retailers and the first two moments of retail sales. Specifically our predictions only held for sufficiently small fixed costs of importing.

The bottom line of our analysis is that in all cases where the model provides clear comparative statics we find the predicted effects. The sector-level regressions thus provides considerable support for our model.

6 Extensions

In this section we go beyond the theoretical model and explore alternative mechanisms through which trade could affect retailing. In Eckel (2009) retail market concentration stems from an increase in the number of varieties available on world markets. As consumers demand variety, retailers expand their assortment and thereby incur greater fixed costs, for instance, because a larger assortment requires more shelf space and better logistics and inventory management. The number of retailers then has to fall so that profits remain non-negative in industry equilibrium. We observe in the data that firms expand the number of varieties they import. But this number is, of course, endogenous. To test the Eckel hypothesis we construct an instrument for the increase in product varieties available on world markets by adjusting the instrument based on world export supply. Instead of computing the instrument based on the value of exports by product, we compute an instrument based on the number of products exported by a country across all destinations by product group. Specifically, we compute $W_{ES}$ as the total number of HS4-digit products by HS2-digit product type exported by country $c$ in a given year. Changes in $W_{ES}$ are thus meant to capture changes in
the comparative advantage of country $c$ in exporting varieties related to the HS2-digit product group. The pre-sample share $s_{i,c}^s$ is also computed at the HS2-digit level and it tells us whether firm $i$ sells varieties of HS2-digit product type (from country $c$) in its store(s) and whether it thus may potentially want to expand the range of this type of good. Hence, a shock to the comparative advantage of country $c$ in exporting this product type will affect firm $i$ more strongly than other firms so that we have a firm-specific, time-varying instrument.

The estimation results are presented in Table 6 and present a very similar pattern as in Table 3. The results also show that our IV strategy adjusted for varieties performs reasonably well. Hence, we can confirm that the observed mechanisms are not only related to the intensive margin of imports, but also to the extensive margin of varieties sourced from abroad.

As a final exercise, we analyze wether increased direct international sourcing affects within firm adjustments related to the number of shops as suggested by the model of Basker and Van (2010b). In their model only a chain retailer can afford to pay the fixed costs of direct imports. Falling trade costs imply that the chain retailer expands the number of stores and forces small, single-store competitors to exit. This is in line with observations for the United States, where large chain retailers (with at least 100 establishments) doubled their share of US retail sales from 18.6% in 1967 to 36.9% in 1997 (Jarmin et al., 2005). This is also a plausible mechanism for Danish retailing, as we observe in our data an increase in the average number of stores per retail firm.\textsuperscript{20} We therefore run similar regressions as in Tables 3 and 6 but now with the number of shops as dependent variable. This variable is a count variable with a large portion of observations equal to one. Hence, a fixed effect Poisson model is an obvious choice for estimation. Since the Poisson estimator turns out to run into convergence problems when many (industry-time) dummies are included, we estimate the model with year dummies only. Moreover, we repeat estimations by OLS with a full set of industry-time dummies included and also perform the corresponding IV estimations. We estimate all models both for import values and number of imported varieties. The results in Table 7 suggest that an increase in direct importing has a significantly positive effect on the number of shops. Rather surprisingly, we find a negative coefficient for firm-level productivity in the regressions. One reason may be that new shops require some time to run successfully so that value added by employee tends to be lower in expansion periods. The positive coefficient on total assets is expected here while average wages are usually insignificant.

In the last column of Table 5 we present some evidence that increases in sector-level imports are associated with a rise in the average number of shops by firm. Again, this is in line with the model of Basker and Van (2010b).

\textsuperscript{20}Concerning the firms in our analysis, the largest retail chains account for between 42% (in 1999) and 50% (in 2008) of total sales. Here a large retail firm is a firm with more than 7 shops which corresponds to the 99th percentile of the distribution of shops by firm in our data.
7 Conclusions

The paper explores the connection between the growth of consumer good imports and changes in retail markets that have taken place over the past decades. We use Danish micro-data to demonstrate that trade liberalization causes retailers that import directly to increase their sales, mark-ups and profits, and, in the case of chain stores, expand the number of stores. This is true whether we measure increased trade in terms of the volume of imports or in terms of the product varieties that are imported. We find that smaller retailers that are not able to access overseas suppliers directly are more likely to exit the market than retailers that are big and import directly. The overall effect of trade is to increase market concentration in retailing.

What does this imply for social welfare? In our model social welfare, $W$, it is approximately equal to

$$W \approx 2N \int_0^{1/2N} (v - \tau x)Ldx$$

$$- \left( \int_0^{c_1} [(t + c)q'(c) + F_1] dG(c) + \int_{c_1}^{c_D} [(w + c)q^D(c)] dG(c) \right) N$$

$$-N_E F_E,$$

where $N_E = N/G(c_D)$, and $v$ is the consumer’s reservation price for one unit of the aggregate consumption good. According to (22), welfare is approximately equal to consumer surplus net of the travel cost paid by consumers (which in a setting with symmetric retailers would be equal to $\frac{L\tau}{4N}$) minus the expected production and retail costs (fixed and variable). In fact, (22) is an upper bound on welfare, since the first term assumes that consumers on average travel 1/4 of the ‘distance’ between any two retailers, which is indeed the case when all retailers charge the same price. Since prices vary across retailers in our setting, it is easily shown that travel costs have to be strictly greater than in (22).

Our empirical results indicate that trade liberalization has little effect on the number of retailers, but shifts sales towards the bigger, more efficient retailers. This suggests a potential welfare gain from a more efficient retail sector that comes on top of any of the usual welfare gains we typically associate with international trade.

Retailing modulates the welfare effects of trade liberalization also because in many markets it is retailers that determine how many varieties of goods are available to consumers (Eckel, 2009, and Raff and Schmitt, 2015b). Retail market structure affects the assortment choice of retailers and determines, in particular, whether there is potentially too little product variety (Eckel, 2009) or too much product variety (Raff and Schmitt, 2015b).  

\[\text{See also Raff and Schmitt (2009) who show that market concentration in retailing and the resulting buyer power of large retailers may limit the welfare gains from trade liberalization.}\]
8 Appendix

8.1 Proof of Hypothesis 1

Using the Pareto distribution, (15) can be rewritten as

\[
\frac{c_{D}^{k+2}}{(k+1)(k+2)} + (w-t)c_{I}^{k}\left(\frac{w-t}{2} + c_{D} - \frac{kc_{I}}{k+1}\right) - \frac{2\tau}{L}\left(c_{M}^{k}F_{E} + F_{I}c_{I}^{k}\right) = 0. \tag{23}
\]

Total differentiation of (23) yields

\[
\frac{dc_{D}}{dt} = \frac{c_{I}^{k}(c_{D} + w - t - \frac{kc_{I}}{k+1})}{c_{D}^{k+1} + (w-t)c_{I}^{k}} > 0, \tag{24}
\]

since \(\frac{c_{D}^{k+1}}{(k+1)} + (w-t)c_{I}^{k} = 2c_{D}^{k}(w+c_{D}-\bar{p}) > 0\) and \(w-t + c_{D} - \frac{kc_{I}}{k+1} > 0\) due to \(w > t\), \(c_{D} > c_{I}\) and \(k < 1+k\).

8.2 Proof of Hypothesis 2

From (10) we obtain

\[
\frac{dc_{I}}{dt} = \frac{dc_{D}}{dt} - \left(\frac{1}{2} + \frac{2\tau F_{I}}{L(w-t)^{2}}\right).
\]

Substituting for \(\frac{dc_{D}}{dt}\) we have

\[
\frac{dc_{I}}{dt} = \frac{1}{c_{D}^{k+1} + (w-t)c_{I}^{k}} \left[ -\left(\frac{1}{2} + \frac{2\tau F_{I}}{L(w-t)^{2}}\right) \left(\frac{c_{D}^{1+k}}{1+k} + (w-t)c_{I}^{k}\right) + c_{I}^{k}\left(c_{D} + w - t - \frac{kc_{I}}{1+k}\right) \right].
\]

Using \(\frac{2\tau F_{I}}{L(w-t)^{2}} = \frac{1}{(w-t)(c_{D}-c_{I}+\frac{w-t}{2})}\) (from (10)) in the above expression and simplifying, we get

\[
\frac{dc_{I}}{dt} = \frac{1}{2c_{D}^{k}(w+c_{D}-\bar{p})} \left\{ -\frac{c_{D}^{1+k}}{1+k} \left[1 + \frac{c_{D} - c_{I}}{w-t}\right] + \frac{c_{I}^{1+k}}{1+k}\right\} < 0. \tag{25}
\]

Note that \(\frac{dc_{I}}{dt} < 0\) provided \(c_{D}^{1+k}(w-t+c_{D}-c_{I}) > (w-t)c_{I}^{1+k}\) which holds since \(w > t\) and \(c_{D} > c_{I}\).

8.3 Proof of Hypothesis 3

Differentiating (6) and (8) with respect to \(t\) and using (24), it is easy to check that, for retailers sourcing from domestic wholesalers,

\[
\frac{dq^{D}}{dt} = \frac{L}{2\tau} \frac{dc_{D}}{dt} > 0 \quad \text{and} \quad \frac{d\pi^{D}}{dt} = \frac{L}{2\tau}(c_{D} - c) \frac{dc_{D}}{dt} > 0.
\]
Next, we show that \( \frac{dc_D}{dt} < 1 \). Rewriting and manipulating (24),

\[
\frac{dc_D}{dt} = \frac{(1 + k)(w - t) + c_D + k(c_D - c_I)}{(1 + k)(w - t) + \frac{c_D^{1+k}}{c_I}}.
\]

(26)

Thus, \( \frac{dc_D}{dt} < 1 \) if \( c_D + k(c_D - c_I) < \frac{c_D^{1+k}}{c_I} \) or if \( 1 + k(1 - \frac{c_I}{c_D}) < \frac{c_D}{c_I} \). If \( k = 1 \), this inequality reduces to \((c_D - c_I)^2 > 0\), and if \( k > 1 \), the RHS of the above inequality increases faster than the LHS. Since \( 0 < \frac{dc_D}{dt} < 1 \), it is easy to check that, for retailers importing directly,

\[
\frac{dq}{dt} = \frac{L}{2\tau} \left[ \frac{dc_D}{dt} - 1 \right] < 0 \quad \text{and} \quad \frac{d\pi}{dt} = \frac{L}{2\tau} (c_D + w - t - c) \left[ \frac{dc_D}{dt} - 1 \right] < 0.
\]

The result on mark-ups follows immediately, as mark-ups are proportional to output.

**8.4 Proof of Hypothesis 4**

Using the Pareto distribution on (13) gives

\[
\bar{p} = w + \frac{k c_D}{k + 1} + \frac{c_D}{2(k + 1)} - \frac{(w - t) c_I^k}{2 c_D^k}.
\]

(27)

Taking the derivative with respect to \( t \) yields:

\[
\frac{dp}{dt} = \left( \frac{1 + 2k}{2 + 2k} \right) \frac{dc_D}{dt} + \frac{1}{2} \frac{c_I^k}{c_D^k} + \frac{k(w - t)}{2} \frac{c_I^k}{c_D^k} \left[ \frac{dc_D}{dt} - \frac{dc_I}{dt} \right] > 0.
\]

(28)

**8.5 Proof of Hypothesis 5**

\[
\frac{dN}{dt} = \frac{\tau}{(c_D + w - \bar{p})^2} \left( \frac{dp}{dt} - \frac{dc_D}{dt} \right).
\]

(29)

Hence

\[
\text{sign} \left\{ \frac{dN}{dt} \right\} = \text{sign} \left\{ \frac{dp}{dt} - \frac{dc_D}{dt} \right\}.
\]

After substituting for \( \frac{dp}{dt} \) and \( \frac{dc_D}{dt} \), we have

\[
\text{sign} \left\{ \frac{dN}{dt} \right\} = \text{sign} \left\{ \left( \frac{-1}{2(k + 1)} \right) \frac{dc_D}{dt} + \frac{1}{2} \frac{c_I^k}{c_D^k} + \frac{k(w - t)}{2} \frac{c_I^k}{c_D^k} \left[ \frac{dc_D}{dt} - \frac{dc_I}{dt} \right] \right\}.
\]

(30)

For \( F_I \) equal to its lower bound \( (F_I = \frac{L}{4\tau} (w - t)^2; \text{see (11)}) \), we have \( c_D = c_I, \frac{dc_I}{dt} = 0, \) and \( \frac{dc_D}{dt} = 1 \). Therefore,

\[
\text{sign} \left\{ \frac{dN}{dt} \right\} = \text{sign} \left\{ \frac{k}{2(k + 1)} + \frac{k(w - t)}{2c_D} \right\} > 0.
\]
8.6 Proof of Hypothesis 6

The average sales volume of active retailers is given by
\[
\bar{q} = q(\bar{p}) = \frac{L}{\tau} \left( \frac{c_D}{2(k+1)} + \frac{(w-t)}{2} \frac{c_I}{c_D^k} \right), \tag{31}
\]
and the derivative with respect to \( t \) is
\[
\frac{d\bar{q}}{dt} = \frac{L}{2\tau} \left( (w-t) \frac{c_I^{k-1}}{c_D^{k+1}} \left( c_D \frac{dc_I}{dt} - c_I \frac{dc_D}{dt} \right) - \frac{c_I^k}{c_D^k} + \frac{1}{k+1} \frac{dc_D}{dt} \right). \tag{32}
\]
For \( F_I \) at its lower bound we have \( c_D = c_I, \frac{dc_I}{dt} = 0, \) and \( \frac{dc_D}{dt} = 1. \) Using these values in (32), we obtain
\[
\frac{d\bar{q}}{dt} = -\frac{L}{2\tau} \left( (w-t) \frac{1}{c_D} + \frac{k}{k+1} \right) < 0.
\]

The variance of retail sales is given by
\[
\sigma_q^2 = \frac{L^2}{4\tau^2} \left\{ \frac{k c_D^2}{(k+2)(k+1)^2} + \left( (w-t)^2 \left[ 1 - \frac{c_I^k}{c_D^k} \right] + \frac{2k(c_D-c_I)(w-t)}{(k+1)} \right) \frac{c_I^k}{c_D^k} \right\}. \tag{33}
\]
Evaluating the derivative at the lower bound of \( F_I \) we obtain:
\[
\frac{d\sigma_q^2}{dt} = \frac{L^2}{4\tau^2} \left\{ (w-t)^2 \frac{k}{c_D} + \frac{2k c_D}{(k+2)(k+1)^2} \right\} > 0.
\]

8.7 Proof of Hypothesis 7

\[
\frac{dH}{dt} = \frac{1}{N} \frac{\sigma_q^2}{q^2} \left[ \frac{d\sigma_q^2}{dt} - \frac{1}{\bar{q}} \frac{d\bar{q}}{dt} \right] - \frac{H dN}{N dt} \tag{34}
\]
Using
\[
\frac{dN}{dt} = \frac{\tau}{(c_D + w - \bar{p})^2} \left( \frac{d\bar{p}}{dt} - \frac{dc_D}{dt} \right) \tag{35}
\]
\[
= \frac{N}{(c_D + w - \bar{p})} \left( \frac{d\bar{p}}{dt} - \frac{dc_D}{dt} \right). \tag{36}
\]

\[
\frac{dH}{dt} = \frac{1}{N} \frac{\sigma_q^2}{q^2} \left[ \frac{d\sigma_q^2}{dt} - \frac{1}{\bar{q}} \frac{d\bar{q}}{dt} \right] - \frac{1}{N (c_D + w - \bar{p})} \left( \frac{\sigma_q^2}{q^2} + 1 \right) \left( \frac{d\bar{p}}{dt} - \frac{dc_D}{dt} \right)
\]
Using \( c_D \equiv \tau/N + \bar{p} - w \)
\[
\frac{dH}{dt} = \frac{1}{N} \frac{\sigma_q^2}{q^2} \left[ \frac{d\sigma_q^2}{dt} - \frac{1}{\bar{q}} \frac{d\bar{q}}{dt} \right] - \frac{1}{\tau} \frac{\sigma_q^2}{q^2} + 1 \left( \frac{d\bar{p}}{dt} - \frac{dc_D}{dt} \right)
\]
Evaluating this derivative at the lower bound of $F_I$ we have

\[
\frac{dH}{dt} = \frac{1}{N} \frac{\sigma_q^2}{\bar{q}^2} \left[ \frac{d\sigma_q^2}{dt} - \frac{1}{\bar{q}} \frac{d\bar{q}}{dt} \right] - \frac{\left( \sigma_q^2 / \bar{q}^2 + 1 \right)}{\tau} \left( \frac{dp}{dt} \right)
\]

The first term is unambiguously positive but approaches zero as $N$ gets big; the second term is negative. Hence $\frac{dH}{dt} < 0$.

### 8.8 Additional Tables

#### Table A.1: Summary Statistics

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>mean</th>
<th>sd</th>
<th>p5</th>
<th>p25</th>
<th>p50</th>
<th>p75</th>
<th>p95</th>
</tr>
</thead>
<tbody>
<tr>
<td>markups</td>
<td>89,062</td>
<td>1.209</td>
<td>0.380</td>
<td>0.716</td>
<td>0.969</td>
<td>1.145</td>
<td>1.365</td>
<td>1.952</td>
</tr>
<tr>
<td>ln(labor prod)</td>
<td>105,339</td>
<td>12.685</td>
<td>0.562</td>
<td>11.805</td>
<td>12.472</td>
<td>12.713</td>
<td>12.984</td>
<td>13.471</td>
</tr>
<tr>
<td>ln(employees)</td>
<td>177,507</td>
<td>5.859</td>
<td>119.317</td>
<td>0.000</td>
<td>0.000</td>
<td>1.000</td>
<td>3.000</td>
<td>13.000</td>
</tr>
<tr>
<td>import dummy</td>
<td>177,507</td>
<td>0.093</td>
<td>0.290</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>ln(import sales)</td>
<td>16,448</td>
<td>11.776</td>
<td>2.656</td>
<td>7.373</td>
<td>9.990</td>
<td>11.663</td>
<td>13.734</td>
<td>15.939</td>
</tr>
<tr>
<td>ln(imported varieties)</td>
<td>16,448</td>
<td>1.257</td>
<td>1.266</td>
<td>0.000</td>
<td>0.000</td>
<td>1.099</td>
<td>2.079</td>
<td>3.638</td>
</tr>
</tbody>
</table>
Table A.2: Sector Classification

<table>
<thead>
<tr>
<th>Nace Codes</th>
<th>Sector Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>52</td>
<td>Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods</td>
</tr>
<tr>
<td>52.1</td>
<td>Retail sale in non-specialized stores</td>
</tr>
<tr>
<td>52.11</td>
<td>Retail sale in non-specialized stores with food, beverages or tobacco predominating</td>
</tr>
<tr>
<td>52.11.10</td>
<td>Grocer’s shops</td>
</tr>
<tr>
<td>52.11.20</td>
<td>All-night shops</td>
</tr>
<tr>
<td>52.11.30</td>
<td>Supermarkets</td>
</tr>
<tr>
<td>52.12</td>
<td>Other retail sale in non-specialized stores</td>
</tr>
<tr>
<td>52.12.10</td>
<td>Variety stores</td>
</tr>
<tr>
<td>52.12.20</td>
<td>Department stores</td>
</tr>
<tr>
<td>52.4</td>
<td>Other retail sale of new goods in specialized stores</td>
</tr>
<tr>
<td>52.41</td>
<td>Retail sale of textiles</td>
</tr>
<tr>
<td>52.41.00</td>
<td>Retail sale of textiles</td>
</tr>
<tr>
<td>52.42</td>
<td>Retail sale of clothing</td>
</tr>
<tr>
<td>52.42.10</td>
<td>Retail sale of ladies’ clothing</td>
</tr>
<tr>
<td>52.42.20</td>
<td>Retail sale of men’s clothing</td>
</tr>
<tr>
<td>52.42.30</td>
<td>Retail sale of men’s and ladies’ clothing</td>
</tr>
<tr>
<td>52.42.40</td>
<td>Retail sale of baby articles and children’s clothing</td>
</tr>
<tr>
<td>52.43</td>
<td>Retail sale of footwear and leather goods</td>
</tr>
<tr>
<td>52.43.10</td>
<td>Retail sale of footwear</td>
</tr>
<tr>
<td>52.43.20</td>
<td>Retail sale of leather goods</td>
</tr>
<tr>
<td>52.44</td>
<td>Retail sale of furniture, lighting equipment and household articles n.e.c.</td>
</tr>
<tr>
<td>52.44.10</td>
<td>Retail sale of furniture</td>
</tr>
<tr>
<td>52.44.20</td>
<td>Retail sale of carpets</td>
</tr>
<tr>
<td>52.44.30</td>
<td>Retail sale of furnishing fabrics</td>
</tr>
<tr>
<td>52.44.40</td>
<td>Retail sale of kitchen utensils, glass and china</td>
</tr>
<tr>
<td>52.44.50</td>
<td>Retail sale of articles for lighting</td>
</tr>
<tr>
<td>52.45</td>
<td>Retail sale of electrical household appliances and radio and television goods</td>
</tr>
<tr>
<td>52.45.10</td>
<td>Retail sale of electric household appliances</td>
</tr>
<tr>
<td>52.45.20</td>
<td>Retail sale of radio and television goods</td>
</tr>
<tr>
<td>52.45.30</td>
<td>Retail sale of records, CD’s, cassettes, etc.</td>
</tr>
<tr>
<td>52.45.40</td>
<td>Retail sale of musical instruments</td>
</tr>
<tr>
<td>52.46</td>
<td>Retail sale of hardware, paints and glass</td>
</tr>
<tr>
<td>52.46.10</td>
<td>Retail sale of hardware</td>
</tr>
<tr>
<td>52.46.20</td>
<td>Retail sale of building materials</td>
</tr>
<tr>
<td>52.46.30</td>
<td>Retail sale of paints and wallpaper</td>
</tr>
<tr>
<td>52.48</td>
<td>Other retail sale in specialized stores</td>
</tr>
<tr>
<td>52.48.05</td>
<td>Retail sale of watches and clocks</td>
</tr>
<tr>
<td>52.48.10</td>
<td>Retail sale of watches, clocks and jewellery</td>
</tr>
<tr>
<td>52.48.15</td>
<td>Retail sale of jewellery</td>
</tr>
<tr>
<td>52.48.20</td>
<td>Retail sale of glasses</td>
</tr>
<tr>
<td>52.48.25</td>
<td>Retail sale of photographic equipment</td>
</tr>
<tr>
<td>52.48.30</td>
<td>Gift shops</td>
</tr>
<tr>
<td>52.48.35</td>
<td>Art shops and galleries</td>
</tr>
<tr>
<td>52.48.40</td>
<td>Retail sale of stamps and coins</td>
</tr>
<tr>
<td>52.48.45</td>
<td>Retail sale of sports goods</td>
</tr>
<tr>
<td>52.48.50</td>
<td>Retail sale of toys and games</td>
</tr>
<tr>
<td>Sector</td>
<td>obs</td>
</tr>
<tr>
<td>-------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Retail sale of textiles, apparel, footwear, and leather</td>
<td>22337</td>
</tr>
<tr>
<td>goods</td>
<td></td>
</tr>
<tr>
<td>Retail sale of furniture, lighting equipment, and household</td>
<td>7783</td>
</tr>
<tr>
<td>articles n.e.c.</td>
<td></td>
</tr>
<tr>
<td>Retail sale of electrical household appliances and radio</td>
<td>5151</td>
</tr>
<tr>
<td>and television goods</td>
<td></td>
</tr>
<tr>
<td>Retail sale of hardware, paints and glass</td>
<td>5342</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Retail sale in non-specialized stores (supermarkets,</td>
<td>17521</td>
</tr>
<tr>
<td>department stores)</td>
<td></td>
</tr>
<tr>
<td>Other retail sale in specialized stores</td>
<td>30928</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table A.3: Median output elasticities and markups by aggregated sector

Sector definition used in paper: NACE 4-digit except for sector 5248 where a more detailed sector definition is used. Usually, the 6-digit sector codes; the exceptions are the aggregation of sectors 524805-524815, 524865-524870, and 524875-524880

Standard deviation in parenthesis
References


[34] Zentes, Joachim, Constantin Hilt, and Peter Domma (2007) *Handelsmonitor Spezial: Global Sourcing im Einzelhandel* (Frankfurt am Main: Deutscher Fachverlag)

Tables
Table 1: Retail Firms over Time

<table>
<thead>
<tr>
<th>Year</th>
<th>Share of retail firms in total imports</th>
<th>Share of imports by retail firms</th>
<th>Average # of imported varieties by importing firms</th>
<th>Weighted average of Herfindahl index</th>
<th>Weighted average of top 5 retailers</th>
<th>Average # of shops per firm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>13.2%</td>
<td>9.4%</td>
<td>176178</td>
<td>3.7</td>
<td>17588</td>
<td>7.2</td>
</tr>
<tr>
<td>2000</td>
<td>12.9%</td>
<td>8.9%</td>
<td>179462</td>
<td>3.8</td>
<td>17779</td>
<td>7.2</td>
</tr>
<tr>
<td>2001</td>
<td>12.7%</td>
<td>8.6%</td>
<td>179094</td>
<td>3.8</td>
<td>17376</td>
<td>7.0</td>
</tr>
<tr>
<td>2002</td>
<td>11.9%</td>
<td>7.4%</td>
<td>182387</td>
<td>3.3</td>
<td>17170</td>
<td>8.6</td>
</tr>
<tr>
<td>2003</td>
<td>12.4%</td>
<td>8.7%</td>
<td>178913</td>
<td>4.0</td>
<td>17330</td>
<td>9.5</td>
</tr>
<tr>
<td>2004</td>
<td>12.9%</td>
<td>9.7%</td>
<td>188335</td>
<td>4.5</td>
<td>17750</td>
<td>9.8</td>
</tr>
<tr>
<td>2005</td>
<td>13.0%</td>
<td>11.0%</td>
<td>192314</td>
<td>5.5</td>
<td>17953</td>
<td>10.2</td>
</tr>
<tr>
<td>2006</td>
<td>13.2%</td>
<td>13.4%</td>
<td>200064</td>
<td>7.4</td>
<td>18174</td>
<td>10.4</td>
</tr>
<tr>
<td>2007</td>
<td>13.2%</td>
<td>13.7%</td>
<td>208288</td>
<td>7.7</td>
<td>18146</td>
<td>11.0</td>
</tr>
<tr>
<td>2008</td>
<td>12.8%</td>
<td>13.8%</td>
<td>205028</td>
<td>7.9</td>
<td>17768</td>
<td>11.0</td>
</tr>
</tbody>
</table>

Notes: Imports refer to consumer goods imports; values in million DKK.
Table 2: Direct Importing Premia

<table>
<thead>
<tr>
<th></th>
<th>ln(Sales)</th>
<th>ln(Profits)</th>
<th>ln(Markups)</th>
<th>ln(# of Shops)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Import Dummy</td>
<td>0.745***</td>
<td>0.129***</td>
<td>0.526***</td>
<td>0.200***</td>
</tr>
<tr>
<td></td>
<td>(0.029)</td>
<td>(0.010)</td>
<td>(0.024)</td>
<td>(0.019)</td>
</tr>
<tr>
<td>ln(# of Empl.)</td>
<td>0.883***</td>
<td>0.588***</td>
<td>0.007***</td>
<td>0.222***</td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.007)</td>
<td>(0.002)</td>
<td>(0.008)</td>
</tr>
<tr>
<td>Observations</td>
<td>177,034</td>
<td>106,473</td>
<td>126,000</td>
<td>104,563</td>
</tr>
<tr>
<td>R2</td>
<td>0.150</td>
<td>0.816</td>
<td>0.073</td>
<td>0.061</td>
</tr>
</tbody>
</table>

Year Dummies          | x          | x           | x           | x              |
Industry Dum.         | x          | x           | x           | x              |
Ind.-year Dum.        | x          | x           | x           | x              |

Note: *** p<0.01, ** p<0.05, * p<0.1
Table 3: Within Firm Adjustments - Value of Imports

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>i</th>
<th>ii</th>
<th>iii</th>
<th>iv</th>
<th>v</th>
<th>vi</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(imp_{it})</td>
<td>0.045*** (0.007)</td>
<td>0.071*** (0.020)</td>
<td>0.057*** (0.013)</td>
<td>0.109*** (0.037)</td>
<td>0.012*** (0.002)</td>
<td>0.019*** (0.006)</td>
</tr>
<tr>
<td>ln(laborprod_{it})</td>
<td>0.103*** (0.024)</td>
<td>0.101*** (0.024)</td>
<td>2.758*** (0.095)</td>
<td>2.758*** (0.092)</td>
<td>0.922*** (0.008)</td>
<td>0.921*** (0.008)</td>
</tr>
<tr>
<td>ln(totalassets_{it})</td>
<td>0.442*** (0.041)</td>
<td>0.431*** (0.041)</td>
<td>0.337*** (0.035)</td>
<td>0.317*** (0.036)</td>
<td>-0.014** (0.007)</td>
<td>-0.018** (0.007)</td>
</tr>
<tr>
<td>ln(meanwage_{it})</td>
<td>0.129*** (0.047)</td>
<td>0.136*** (0.046)</td>
<td>-2.301*** (0.121)</td>
<td>-2.293*** (0.119)</td>
<td>-1.035*** (0.012)</td>
<td>-1.033*** (0.012)</td>
</tr>
</tbody>
</table>

Observations: 5,785, 4,789, 5,417
R2: 0.428, 0.579, 0.896

Excluded instruments in first stage

<table>
<thead>
<tr>
<th>Inst - ln(WES)</th>
<th>OLS (0.041)</th>
<th>IV (0.042)</th>
<th>IV (0.044)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inst - ln(XRAT)</td>
<td>0.319*** (0.085)</td>
<td>0.304*** (0.083)</td>
<td>0.311*** (0.091)</td>
</tr>
</tbody>
</table>

Hansen J (p-value): 0.883, 0.545, 0.187
F-test of excl. inst.: 28.033, 38.585, 24.729

Year Dummies: x x x x x x
Industry Dummies: x x x x x x
Ind.-year Dummies: x x x x x x

Note: *** p<0.01, ** p<0.05, * p<0.1
**Table 4: Exit Regressions**

<table>
<thead>
<tr>
<th>Definition of percentiles</th>
<th>i (p10)</th>
<th>ii (p20)</th>
<th>iii (p5)</th>
<th>iv</th>
<th>v</th>
<th>vi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Across Sectors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within Sectors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dimp&lt;sub&gt;it&lt;/sub&gt;</td>
<td>-0.032***</td>
<td>-0.033***</td>
<td>-0.028***</td>
<td>-0.029***</td>
<td>-0.035***</td>
<td>-0.036***</td>
</tr>
<tr>
<td>ln(imp&lt;sub&gt;st&lt;/sub&gt;)</td>
<td>-0.001</td>
<td>-0.001</td>
<td>-0.003**</td>
<td>-0.002</td>
<td>0.001</td>
<td>-0.001</td>
</tr>
<tr>
<td>dsize&lt;sub&gt;it&lt;/sub&gt;</td>
<td>0.341***</td>
<td>0.336***</td>
<td>0.243***</td>
<td>0.235***</td>
<td>0.440***</td>
<td>0.429***</td>
</tr>
<tr>
<td>intera</td>
<td>0.018***</td>
<td>0.010***</td>
<td>0.020***</td>
<td>0.007***</td>
<td>0.008***</td>
<td>0.009***</td>
</tr>
<tr>
<td>Observations</td>
<td>142,089</td>
<td>142,089</td>
<td>142,089</td>
<td>142,089</td>
<td>142,089</td>
<td>142,089</td>
</tr>
<tr>
<td>R2</td>
<td>0.102</td>
<td>0.111</td>
<td>0.098</td>
<td>0.102</td>
<td>0.096</td>
<td>0.096</td>
</tr>
<tr>
<td>Year Dummies</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Industry Dummies</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

Note: *** p<0.01, ** p<0.05, * p<0.1

**Table 5: Sector-level Regressions**

<table>
<thead>
<tr>
<th>i (ln(Share Importing Firms))</th>
<th>ii (ln(Herfindahl Index))</th>
<th>iii (ln(# of Firms))</th>
<th>iv (ln(Average Sales per Firm))</th>
<th>v (ln(Variance of Sales per Firm))</th>
<th>vi (ln(Average # of Shops per Firm))</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(imp&lt;sub&gt;st&lt;/sub&gt;)</td>
<td>0.223***</td>
<td>0.111**</td>
<td>0.007</td>
<td>-0.012</td>
<td>0.105</td>
</tr>
<tr>
<td></td>
<td>(0.058)</td>
<td>(0.044)</td>
<td>(0.061)</td>
<td>(0.061)</td>
<td>(0.080)</td>
</tr>
<tr>
<td>ln(sales&lt;sub&gt;st&lt;/sub&gt;)</td>
<td>-0.302</td>
<td>0.185</td>
<td>0.509***</td>
<td>0.496***</td>
<td>1.739***</td>
</tr>
<tr>
<td></td>
<td>(0.332)</td>
<td>(0.307)</td>
<td>(0.150)</td>
<td>(0.151)</td>
<td>(0.419)</td>
</tr>
<tr>
<td>Number of observations</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>R2</td>
<td>0.948</td>
<td>0.979</td>
<td>0.993</td>
<td>0.996</td>
<td>0.996</td>
</tr>
<tr>
<td>Year Dummies</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Industry Dummies</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

Note: *** p<0.01, ** p<0.05, * p<0.1
Table 6: Within Firm Adjustments - Imported Varieties

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>i</th>
<th>ii</th>
<th>iii</th>
<th>iv</th>
<th>v</th>
<th>vi</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(imp&lt;sub&gt;it&lt;/sub&gt;)</td>
<td>0.048***</td>
<td>0.088***</td>
<td>0.107***</td>
<td>0.109**</td>
<td>0.015***</td>
<td>0.021**</td>
</tr>
<tr>
<td>(0.010)</td>
<td>(0.032)</td>
<td>(0.021)</td>
<td>(0.053)</td>
<td>(0.003)</td>
<td>(0.009)</td>
<td></td>
</tr>
<tr>
<td>ln(laborprod&lt;sub&gt;it&lt;/sub&gt;)</td>
<td>0.118***</td>
<td>0.117***</td>
<td>2.749***</td>
<td>2.749***</td>
<td>0.925***</td>
<td>0.925***</td>
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<tr>
<td>(0.025)</td>
<td>(0.024)</td>
<td>(0.092)</td>
<td>(0.091)</td>
<td>(0.008)</td>
<td>(0.008)</td>
<td></td>
</tr>
<tr>
<td>ln(totalassets&lt;sub&gt;it&lt;/sub&gt;)</td>
<td>0.454***</td>
<td>0.447***</td>
<td>0.349***</td>
<td>0.349***</td>
<td>-0.012*</td>
<td>-0.013*</td>
</tr>
<tr>
<td>(0.039)</td>
<td>(0.044)</td>
<td>(0.116)</td>
<td>(0.114)</td>
<td>(0.012)</td>
<td>(0.011)</td>
<td></td>
</tr>
<tr>
<td>ln(meanwage&lt;sub&gt;it&lt;/sub&gt;)</td>
<td>0.100**</td>
<td>0.104**</td>
<td>-2.311***</td>
<td>-2.310***</td>
<td>-1.040***</td>
<td>-1.039***</td>
</tr>
<tr>
<td>(0.044)</td>
<td>(0.044)</td>
<td>(0.116)</td>
<td>(0.114)</td>
<td>(0.012)</td>
<td>(0.011)</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>6,178</td>
<td>6,178</td>
<td>5,129</td>
<td>5,129</td>
<td>5,792</td>
<td>5,792</td>
</tr>
<tr>
<td>R2</td>
<td>0.420</td>
<td>0.343</td>
<td>0.585</td>
<td>0.528</td>
<td>0.894</td>
<td>0.877</td>
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</table>

Excluded instruments in first stage

| Inst - ln(WES) | 0.210*** | 0.250*** | 0.227*** |
|                | (0.058)  | (0.063)  | (0.062)  |
| Inst - ln(XRAT) | 0.079   | 0.056   | 0.051   |
|                | (0.065)  | (0.069)  | (0.068)  |

Hansen J (p-value) 0.303 0.588 0.081
F-test of excl. inst. 35.859 37.385 31.178

Year Dummies x x x x x x
Industry Dummies x x x x x x
Industry-year Dummies x x x x x x

note: *** p<0.01, ** p<0.05, * p<0.1
Table 7: Within Firm Adjustments - Number of Shops

<table>
<thead>
<tr>
<th></th>
<th>Import Values</th>
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<th>Imported Varieties</th>
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<tr>
<td></td>
<td></td>
<td>Poisson</td>
<td>OLS</td>
<td>IV</td>
</tr>
<tr>
<td>ln(imp_{it})</td>
<td>0.071***</td>
<td>0.031***</td>
<td>0.043***</td>
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<tr>
<td></td>
<td>(0.027)</td>
<td>(0.009)</td>
<td>(0.015)</td>
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<tr>
<td>ln(laborprod_{it})</td>
<td>-0.092***</td>
<td>-0.068***</td>
<td>-0.069***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.031)</td>
<td>(0.013)</td>
<td>(0.013)</td>
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<tr>
<td>ln(totalassets_{it})</td>
<td>0.302***</td>
<td>0.110***</td>
<td>0.105***</td>
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<td></td>
<td>(0.045)</td>
<td>(0.020)</td>
<td>(0.020)</td>
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<tr>
<td>ln(meanwage_{it})</td>
<td>-0.217***</td>
<td>-0.036</td>
<td>-0.032</td>
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<tr>
<td></td>
<td>(0.052)</td>
<td>(0.024)</td>
<td>(0.024)</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>5,829</td>
<td>5,829</td>
<td>5,829</td>
<td></td>
</tr>
<tr>
<td>R2</td>
<td>0.148</td>
<td>0.078</td>
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Excluded instruments in first stage

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<th>Poisson</th>
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<th>Poisson</th>
<th>OLS</th>
<th>IV</th>
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</thead>
<tbody>
<tr>
<td>Inst - ln(WES)</td>
<td>0.095**</td>
<td></td>
<td></td>
<td></td>
<td>0.211***</td>
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<td></td>
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<tr>
<td></td>
<td>(0.041)</td>
<td></td>
<td></td>
<td></td>
<td>(0.058)</td>
<td></td>
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<tr>
<td>Inst - ln(XRAT)</td>
<td>0.321***</td>
<td></td>
<td></td>
<td></td>
<td>0.065</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>(0.085)</td>
<td></td>
<td></td>
<td></td>
<td>(0.064)</td>
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<tr>
<td>Hansen J (p-value)</td>
<td>0.268</td>
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<td>0.887</td>
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<td>F-test of excl. inst.</td>
<td>28.024</td>
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<td>32.759</td>
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</tbody>
</table>

Year Dummies   | x      | x      | x    | x    | x      | x    | x    | x    |
Industry Dummies | x      | x      | x    | x    | x      | x    | x    |
Industry-year Dummies | x      | x      | x    | x    | x      | x    | x    |

Note: *** p<0.01, ** p<0.05, * p<0.1