Exchange Rate Pass-Through, Currency Invoicing and Trade Partners

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Abstract

In this paper, we develop a model of monopolistic competition and international trade that makes several predictions about the relationship between exchange rate pass-through and firm/product characteristics. We first show that exchange rate pass-through to import prices will be higher for goods priced in U.S. dollars (for importing countries other than the U.S.), and low for goods priced in the domestic currency. New to the literature, we find that pass-through to goods priced in other currencies will be somewhere in between these two extremes. Next, we show that there is a U-shaped relationship between market share and pass-through. Finally, the model predicts that pass-through will be lower in the case of indirect trade (where the producing country is not the final exporter) than in direct trade (goods are shipped directly from the country of production). We then test these hypotheses using a unique data set that covers the universe of Canadian imports over a six-year time span. Our preliminary findings, that focus on a subset of nine product types, show strong support for the pass-through and currency hypotheses, and mild support for the market share and indirect trade hypotheses.

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1. Introduction

This paper examines the characteristics of exchange rate pass-through in a large data set of Canadian import prices, focusing on the role of currency invoicing, the market share of exporters, and the patterns of international trade in determining the size of pass-through. The relationship between exchange rates and goods prices has been one of the most discussed and studied areas in international economics. A large part of the core theory of international trade and macroeconomics depends on assumptions about

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how prices, both at the retail level and ‘at the dock’ (at both the aggregate and individual firm levels), respond to changes in exchange rates. One central concept in both the theory and empirical work on this topic is that of exchange rate pass-through. This pertains to the question of how much of an exchange rate change is reflected in domestic currency goods prices (when various controls are applied). There is a very large literature on exchange rate pass-through, both at the level of the individual firm and at a more aggregate level of imports (see Knetter, 1989, Campa and Goldberg, 2005, and Burstein and Gopinath, 2013).

It is an almost universally recognized fact that at all levels of aggregation, pass-through of exchange rate changes to prices is less than full. Early studies by Krugman (1987) and Froot and Klemperer (1989) suggested this was due to the presence of strategic forces leading firms to engage in ‘pricing-to-market’. Later literature proposed that slow nominal price adjustment and local currency pricing (Devereux, Engel and Storgaard, 2003) may be responsible for partial pass-through both at the import price level and the level of retail prices. These two explanations are not at all exhaustive, however. Other theories of low exchange rate pass-through stress the role of distribution costs, or composition effects (Burstein, Neves and Rebelo, 2003, Nakamura and Zerom, 2010). Nor are the theories mutually exclusive—Engel (2006) and Gopinath et al. (2010) argue that the decision to engage in local currency pricing, which implies low short run pass-through, may coincide with the motivation for pricing to market, which, in turn, implies less than complete long run pass-through.

Progress in this literature has always been constrained by data availability. Recently, many studies of exchange rate pass-through have availed of more detailed micro data sets of goods prices (see Gopianath et al., 2011, for example). But it has been difficult to obtain comprehensive matched data on currency of invoicing and goods prices. The papers by Gopinath and Rigibon (2008) and Gopinath et al. (2010) focus on U.S. export and import price data. But it is widely accepted that the U.S. may be quite a special case (albeit an important one) due to the central nature of the U.S. dollar in international trade settlement and invoicing (Goldberg and Tille, 2008).

This paper adds to the literature on exchange rate pass-through by first developing a model of monopolistic competition that has three testable implications relating the relationship between pass-through, the currency of import price invoicing, the market share of exporters, and direct versus indirect trade. More specifically, we present a flexible price model to explore the determinants of exchange rate pass-through into import prices, then add sticky prices to emphasize the critical role of currency of pricing. This model predicts that firms that prefer lower pass-through to import prices will choose to invoice in the currency of the importing country. Those that prefer higher pass-through will choose their own currency or the U.S. dollar. The model shows that in the context of a small open economy, pass-through will be highest for goods priced in U.S. dollars, it will be slightly lower for goods priced in Euros (because most intermediate imported inputs are priced in U.S. dollars) and lowest for the domestic currency.

\[\text{There is a growing literature using data for other countries. See, for example, Fitzgerald and Haller, 2013 (Ireland), Amiti et al., 2012 (Belgium), and Cravino, 2014 (Chile).}\]
The model also predicts a U-shaped relationship between pass-through and market share (a prediction similar to the models presented in Auer and Schoenle, 2013, and Garetto, 2014). Firms with a small market share are usually small firms that charge a small markup. As a result, they have little room to adjust their markup, and hence their price, in the face of exchange rate movements. For this reason, they must pass all movements in the exchange rate on to the importing firm, and as a result, pass-through will be high. As market share increase, so does firm size and markups. This gives the exporting firm more room to adjust their markup and price to market, to maintain market share, which implies lower pass-through. However, once firms have sufficient market share, they no longer need to adjust their foreign currency price to maintain market share, and therefore pass-through increases. This all results in a U-shaped relationship between pass-through and market share.

The final prediction of the model relates to pass-through and direct versus indirect trade. A producing firms can choose to ship a product directly to the importing country (either by themselves or through an intermediary in their own country) or ship it via a third country. The model we develop predicts that pass-through will be higher for goods shipped directly to the importing country than for goods shipped indirectly through a third country. [NEED MORE ON THE MECHANISM HERE].

Our next step is to take these three predictions to the data. We use a new and extremely large data set on Canadian import prices at a highly disaggregated level. The data includes the universe of Canadian imports over a six-year period from 2002-2008. The rich nature of the data allows us to investigate how exchange rate pass-through differs for different categories of imports, for different currencies of invoice, by country of origin and currency of export, and a series of other features of import prices. In the current version of this paper (it remains a work in progress), we focus on nine products or sectors, which make up roughly thirty percent of all Canadian imports (by value) in any given month. The data set tracks every single import in to Canada, and we use unit values (shipment value divided by the number of units) as a proxy for price. We start by measure overall pass-through in each product category and find that there is significant variation. For example, pass-through to import prices is near complete in Metal Products at 0.97 (that is, a one percent increase in the exchange rate is associated with a 0.97 percent increase in Canadian-dollar import prices), but it is only 0.17 for Industrial Machinery. Pass-through estimates for all other industries fall within this range.

We then use these data to test the three predictions of the model. We find strong evidence that pass-through is higher for U.S. dollar-priced goods than for Canadian-dollar priced goods (a finding that is similar to what is found in Gopinath et al., 2010), as this holds for all nine products/sectors. We also find that pass-through to Euro-priced goods is general lower than U.S. dollar-priced goods, but higher than Canada-dollar priced goods, as predicted by the model.

Next, we look into the relationship between pass-through and market share. Here we find mixed evidence, as three of the nine products/sectors show evidence of a U-shaped relationship. Five other industries exhibit monotonically downward-sloping relationships, and for one, the curve is upward sloping. We urge caution in the interpretation of these results, as market share is defined by the country of origin and export, rather than the exporting firm. The full data set has a exporting firm name variable, but we currently do not have access to it. Once we do, we can redo do this analysis.
with a finer measure of market share. The current results should be seen a preliminary evidence of the pass-through and market share relationship.

Finally, to test the prediction concerning direct versus indirect trade, we focus on a single product. For Apparel, a significant portion of all goods that arrive in Canada are produced in China, India and Bangladesh. However, many goods enter Canada through the U.S. This product/sector therefore offers an ideal setting to study direct versus indirect trade. We find that pass-through for goods produced in China and India is significantly higher if the good is shipped directly to Canada and lower if it enters Canada through the U.S.

The paper proceeds as follows. Section 2 presents the theoretical discussion. Section 3 describes the data and provides summary statistics. In section 4, we present the empirical model and test the predictions of the model. Finally, Section 5 concludes.

2. Theoretical Discussion

In this section we explore the determinants of exchange rate pass-through into import prices in a simple model of monopolistic competition. This will help to frame the empirical analysis of the following sections. For the most part, the discussion borrows from previous literature, especially Burstein and Gopinath (2013), Amiti et al. (2012), Gopinath et al. (2010), and Corsetti and Dedola (2005).

Take a firm $i$ exporting to a ‘home’ market within a sector $k$. At this stage we leave the country associated with this firm unsubscripted. The firm is assumed to have the CES demand schedule given by:

$$x_{ik} = p_{ik}^{-\rho}p_k^{\rho-\eta}X$$

(2.1)

where $p_{ik}$ is the firm’s price evaluated in home (importers’s) currency, and $p_k$ is the sectoral price (also in home currency). We assume there is a finite number of firms in the sector, $N$, where $N$ is small enough that firm $i$ takes into account the impact of its pricing decision on the sectoral price index. The sectoral price index is defined as:

$$p_k = \left[ \sum_{i=1}^{N} p_{ik}^{1-\rho} \right]^{\frac{1}{1-\rho}}$$

(2.2)

The total demand for sector $k$ goods is defined as:

$$x_k = p_k^{-\eta}X$$

(2.3)

As is usual, we assume that $\rho > \eta$, so that the elasticity of demand for individual goods is greater than the elasticity of demand for the sectoral composite good.

Firm $i$’s production technology combines local (exporter country) labour, some distribution services from the importing (home) economy, and possibly intermediate imports from a third country. We
assume constant returns to scale in production. Firm $i$ then has the technology given by:

$$x = \left[a^{\frac{1}{\gamma}} F_{xi}^{1-\frac{1}{\gamma}} + (1-a)^{\frac{1}{\gamma}} N_{xi}^{1-\frac{1}{\gamma}}\right]^{\frac{1}{\gamma-1}} \tag{2.4}$$

where $F_{xi}$ represents domestic production of firm, and $N_{xi}$ represents local (home country) content, such as distribution services, marketing costs, etc. In turn, we define domestic production as being determined by a combination of domestic labour and imported intermediate inputs:

$$F_{xi} = L^{\alpha} I^{1-\alpha}_{xi} \tag{2.5}$$

To simplify notation and discussion, assume that the both the price of imported intermediate inputs and the price of local distribution services in the home country is set equal to unity. Then the firm’s cost function is defined as:

$$c(w, s_f, s, x) = \left[a^{\rho}(\frac{1}{s_f})^{1-\alpha} + (1-a)\left(\frac{1}{s}\right)^{1-\gamma}\right]^{\frac{1}{1-\gamma}} x \tag{2.6}$$

where $w$ is the nominal wage in the exporter’s currency, $s_f$ is the exchange rate between the exporter’s currency and the imported intermediate currency (intermediate firm’s country currency price of exporter currency), and $s$ is the exchange rate between the home currency and the exporter currency (home cost of exporter currency).

2.1. Exchange Rate Pass-Through with Flexible Nominal Prices

If prices are fully flexible, the currency in which the firm sets its price is irrelevant. Thus, without loss of generality, say the firm sets its price in home currency (local currency).

Evaluated in home currency, the exporter’s profit is defined as:

$$p_{ik} x_{ik} - sc(w, s_f, s, x) \tag{2.7}$$

If the exporter sets its price freely, its profit maximizing price is given by:

$$p_{ik} = \frac{\epsilon_{ik}}{\epsilon_{ik} - 1} s \left[a^{\rho}(\frac{1}{s_f})^{1-\alpha} + (1-a)\left(\frac{1}{s}\right)^{1-\gamma}\right]^{\frac{1}{1-\gamma}} \tag{2.8}$$

where $\epsilon$ is defined as the firms demand elasticity, given by

$$\epsilon = -\frac{d \log(x_{ik})}{d \log(p_{ik})} = \rho - (\rho - \eta) \left[\frac{p_{ik}}{p_k}\right]^{1-\rho} \tag{2.9}$$

Now the market share of firm $i$ in sector $k$ sales is defined as:

$$\left[\frac{p_{ik}}{p_k}\right]^{1-\rho} = \frac{p_{ik} x_{ik}}{\sum_{i=1}^{N} p_{ik} x_{ik}} \equiv \theta_{ik} \tag{2.10}$$
So the firm’s elasticity is
\[ \epsilon(\theta_{ik}) = \rho - (\rho - \eta)\theta_{ik}. \tag{2.11} \]

If the firm’s price is fully flexible, we can obtain the implied pass-through from the exchange rate to its price as follows. Take a log approximation around an initial equilibrium where \( w^{\alpha(\frac{1}{\eta})} = \frac{1}{\rho} \). We obtain the expression
\[
\frac{d\log p_{ik}}{d\log s} = \frac{a}{1 + \omega} + \frac{\omega}{(1 + \omega)(1 - \theta_{ik})} \sum_{j \neq i} \theta_{jk} \frac{d\log p_{jk}}{d\log s} + \frac{a}{1 + \omega} \left[ \frac{d\log w}{d\log s} - (1 - \alpha) \frac{d\log s_{f}}{d\log s} \right] \tag{2.12}
\]
where \( \omega = -\frac{d\log(\mu)}{d\log(p_{ik})} \) is the elasticity of the markup to the firm’s price. We can calculate this elasticity as follows\(^2\):
\[
\omega = \frac{(\rho - \eta)(\rho - 1)\theta_{ik}(1 - \theta_{ik})}{\epsilon(\theta_{ik})(\epsilon(\theta_{ik}) - 1)}.. \tag{2.13}
\]

The expression (2.12) contains a number of separate determinants of exchange rate pass-through to the individual firm’s price that can help guide our approach to the data. The first term on the right hand side of (2.12) captures the direct effect of the exchange rate on home currency denominated costs, adjusted for the local content used in production, and taking account of the impact of the price on the firm’s markup through the change in its market share. The second term captures the indirect effect of the exchange rate change on the firm’s markup through the degree to which all other firms in the sector adjust their price to the exchange rate. The third and fourth terms represent the proportional impact of the exchange rate change on the firm’s domestic costs, and the degree to which the firm’s cost of imported intermediate inputs is correlated with changes in the home country exchange rate.

To see this in more detail, assume that \( \frac{d\log p_{jk}}{d\log s} = 0 \) for all \( j \neq i \), \( \frac{d\log w}{d\log s} = 0 \), and \( \frac{d\log s_{f}}{d\log s} = 0 \). Then pass-through equals the first term on the right hand side, \( \frac{a}{1 + \omega} \). Even if there was no local content, so that \( a = 1 \), pass-through would be less than unity because a rise in the firm’s price reduces its market share, and for \( \rho > \eta \), this reduces its optimal markup. When \( a < 1 \), this further reduces pass-through because some of the firm’s costs are home-currency denominated.

While endogenous markups will lower pass-through in this fashion, the effect of the firm’s market share itself on this pass-through term is ambiguous. This is because \( \omega \) is non-monotonic in \( \theta_{ik} \). To see this, note that
\[
\frac{d\omega}{d\theta_{ik}} = \frac{\eta(\eta - 1)\theta_{ik}^2 - \rho(\rho - 1)(1 - \theta_{ik})^2}{\epsilon(\theta_{ik})^2(\epsilon(\theta_{ik}) - 1)^2}. \tag{2.14}
\]
For \( \theta_{ik} \) close to zero, this is negative, while for \( \theta_{ik} \) close to unity, it is positive. Intuitively, for \( \theta_{ik} \) equal to zero or unity, the firm is either infinitesimal relative to the market, or is a monopoly firm in the sector, and the markup is a constant, determined only by elasticities. In between these two extremes, the firm’s markup is endogenous, and increasing in \( \theta_{ik} \). But exchange rate pass-through depends not on

\(^2\)Note, this is the ‘full’ elasticity, which takes into account the effect of the change in the firm’s price on the sectoral price index. In Amiti et al. (2013), they derive a ‘partial elasticity’ which involves taking \( p_{ik} \) as given in deriving the elasticity.
the markup itself, but on the elasticity of the markup $\omega$. For very low $\theta_{ik}$, this elasticity is increasing in $\theta_{ik}$, and pass-through is decreasing in $\theta_{ik}$. But as $\theta_{ik}$ approaches one, the elasticity is decreasing in $\theta_{ik}$, and pass-through is increasing in $\theta_{ik}$. It is important to note that this represents the effect of the market share for an individual firm. The definition of market share we use in our empirical measures is a wider one, as described below.

Even when we focus on pass-through at the level of the individual firm, it is important to realize that an individual firm’s exchange rate pass-through cannot be divorced from the overall sectoral response. If for instance, all firms have identical marginal costs, and are affected equally by exchange rate changes, then in an industry equilibrium the individual firm’s pass-through will be unity, conditional on marginal costs, for each firm. This is because, using the second expression in (2.12), given that $\frac{d \log p_{ik}}{d \log s_{ik}}$ is the same for all $i = 1..N$, the terms involving markup elasticities cancel out.

2.1.1. Country Shares versus firms shares

Up to now, we have implicitly assumed that all exporting firms into sector $k$ produce in the same country, so the exchange rate relevant for affecting the import price is the same for all firms. But our data includes the full set of countries that export to Canada within any given sector. Hence the exchange rate affecting marginal costs will be country specific. Even if all firms within a given country are equally responsive to an exchange rate change, pass-through for a given sector may be limited because a price adjustment will affect the price of exported goods from that country relative to the rest of the world’s exports, within each sector. Because of this, we define the sectoral market share of a country as opposed to a firm within each sector, as follows. Let the market share of all goods in sector $k$ from country $z$ be:

$$\theta_{zk} = \sum_{ik, i \in z} \theta_{ik}$$

To see how this affects pass-through, assume that all firms within a country have identical market costs and therefore are affected equally by an exchange rate change between the home country and country $z$ (where we denote this as $s_z$). Then, as before, assume that $\frac{d \log p_{jk}}{d \log s_{z}} = 0$ for all $j \notin z$, $\frac{d \log w}{d \log s_{z}} = 0$, and $\frac{d \log s_{f}}{d \log s_{z}} = 0$. Then exchange rate pass-through in response to a change in $s_z$ is

$$\frac{d \log p_{izk}}{d \log s_{z}} = \frac{a(1 - \theta_{izk})}{(1 - \theta_{izk}) + \omega(1 - \theta_{zk})}$$

(2.15)

Then an increase in market share of country $z$ will affect the right hand side of (2.15) in the following way

$$\frac{d^2 \log p_{izk}}{d \log s_{z} d \theta_{zk}} = \frac{a \omega}{((1 - \theta_{izk}) + \omega(1 - \theta_{zk}))^2} \left( \frac{d \theta_{zk}}{d \theta_{izk}} \frac{(1 - \theta_{izk})}{(1 - \theta_{zk})} - 1 \right)$$

$$- \frac{a(1 - \theta_{izk})(1 - \theta_{ik})}{((1 - \theta_{izk}) + \omega(1 - \theta_{zk}))^2} \frac{d \omega}{d \theta_{izk}}$$

(2.16)

The first line of (2.16) captures the impact of a rise in the market share of the country $z$ on exchange
rate pass-through for a given elasticity of the individual firm’s markup $\omega$. This is unambiguously positive, since $\theta_{zk} > \theta_{izk}$, and $\frac{d\theta_{zk}}{d\theta_{izk}} > 1$ when all firms within country $z$ have the same market share. Hence, a rise in the share of an exporting country in total world exports will increase the measured exchange rate pass-through through this direct effect, because more and more of the sectoral prices will be impacted by the same exchange rate, and the dampening impact of the relative price change on each firm’s pass-through response is lessened. But the second line may be positive or negative, since as shown above the elasticity of the markup with respect to an individual firm’s market share may be positive or negative. In particular, when one firm within a country tends to dominate all exports coming from the country, we have $\theta_{zk} \approx \theta_{izk}$, and $\frac{d\theta_{zk}}{d\theta_{izk}} \approx 1$, so that the first line is approximately zero, while the second line may be positive or negative, depending on the share of the country in total world exports in sector $k$. In the data analysis below, our measure of pass-through effectively captures the term (2.15), and therefore should capture both these direct and indirect effects of market share.

Finally, (2.12) makes clear that the presence of imported intermediate inputs for the foreign exporter, combined with correlated exchange rate movements, so that $\frac{d\log s^f}{d\log s} > 0$, reduces pass-through by reducing the fraction of the exporter’s costs that are affected by exchange rates. In this way, depending on the response of $s^f$, imported intermediate inputs act in the same way as local content in production, reducing pass-through both at the firm level and at the sectoral level.

2.2. Sticky Prices and the Choice of Invoicing Currency

If firms cannot freely adjust their prices, then exchange rate pass-through may differ substantially from that described in the last subsection. A large literature has linked exchange rate pass-through to price stickiness of various kinds.\footnote{See Engel (2008) and Devereux and Yetman (2009), for instance.} One of the key determinants of exchange rate pass-through under sticky prices is the currency in which prices are set (e.g. Devereux and Engel, 2003.). If prices are set in producers currency (PCP), then pass-through is high, since final-goods prices in the importing country will adjust one-for-one with exchange rates. But if prices are set in the consumer’s currency (LCP), the pass-through is much lower.

Empirical evidence on invoicing currency practices (see Cook and Devereux, 2006, Goldberg and Tille, 2009, Gopinath and Rigobon, 2008), suggest that there is a range of outcomes varying between LCP and PCP, although evidence on very low pass-through to consumer good prices (Engel, 1999) suggest significant LCP at the retail level. Since the choice of price-setting currency is of critical importance, an obvious question is: what factors should lead a firm to choose one currency over another in setting nominal prices for export?\footnote{Corsetti and Pesenti (2005) allow for the possibility that firms set prices somewhere ‘in between’ LCP and PCP, through the choice of an exchange rate indexing parameter which allows the selling price to adjust partially to ex-post exchange rate movements. Empirically, however, this practice does not seem to be observed. Invoicing patterns seem to be fixed in one or another currency.} Bachetta and Van Wincoop (2003), Devereux, Engel and Storgaard (2004) and Engel (2007) develop models of endogenous currency of pricing, in which firms must set a price in advance and can choose between LCP and PCP. Engel (2007) shows an intimate relationship between the determinants of pass-through for the firm with flexible prices, and the choice of currency.
of price-setting for the sticky price firm. In particular, he shows that a firm that would desire a large exchange rate pass-through elasticity under flexible prices is more likely to choose PCP if it must set the nominal price in advance. Gopinath et al. (2010) extend Engel’s result to a model of Calvo staggered pricing. They show that the critical determinant of the currency of pricing is what they define as ‘medium run pass-through’, which measures the pass-through of exchange rate changes to a firm’s price after it has an opportunity to adjust its price. In the empirical analysis below, we focus on a similar measure of exchange rate pass-through.

Adapting the results of Gopinath et al. (2010) to our model, assume that the firm can re-set prices only at random intervals according to the Calvo price adjustment process, where $\kappa$ represents the probability that the firm’s price is constant from one period to the next. Let $\tilde{p}_t$ be the firm’s desired price in the home currency, as defined in the previous subsection. Then $\tilde{p}_t^* = \tilde{p}_t - s_t$ is the desired price in the foreign currency. Assuming a discount factor $\beta$, up to a first order approximation in the Calvo model, the optimal price in local (i.e. home) currency for a firm which re-sets its price is given by:

$$p_{LCP}^t = (1 - \beta \kappa) E_t \sum_{j=0}^{\infty} (\beta \kappa)^j \tilde{p}_{t+j}$$ (2.17)

With producer currency pricing, the optimal price is:

$$p_{PCP}^t = (1 - \beta \kappa) E_t \sum_{j=0}^{\infty} (\beta \kappa)^j (\tilde{p}_{t+j}^* + s_{t+j}) = (1 - \beta \kappa) E_t \sum_{j=0}^{\infty} (\beta \kappa)^j (\tilde{p}_{t+j} - s_{t+j})$$ (2.18)

If the exchange rate is a random walk then it follows that $p_{LCP}^t = p_{PCP}^t + s_t$. In this case, if the currency of price setting was assigned exogenously, independent of firm characteristics, then it would have no consequences for exchange rate pass-through, after the time of first price setting. But the key message of Gopinath et al. (2008) is that firms will self-select into LCP or PCP pricing decisions based on the exchange rate pass-through characteristics of their desired price. So therefore, there will be systematic differences in $\tilde{p}_{t+j}$ for LCP firms relative to PCP firms, with $\tilde{p}_{t+j}$ having a higher response to exchange rates for the latter than the former. Firms that wish to have a high medium run pass-through from the exchange rate to the local currency price will choose to set prices in the producer currency, otherwise they will choose local currency. The implication is that exchange rate pass-through is higher for PCP firms, not because of price stickiness per-se, but because PCP firm’s are those which desire to have a higher pass-through from unanticipated exchange rate shocks to local currency prices.

Using the results of Gopinath et al. (2010), it can be shown that a firm will choose LCP pricing over PCP pricing in currency $z$ under the condition:

$$\sum_{j=0}^{\infty} (\beta \kappa)^j \text{Var}(s_{t+j}^z) \left(1 - \frac{\text{Cov}(\tilde{p}_{t+j}, s_{t+j}^z)}{\text{Var}(s_{t+j}^z)}\right) > 0$$ (2.19)

The term $\frac{\text{Cov}(\tilde{p}_{t+j}, s_{t+j}^z)}{\text{Var}(s_{t+j}^z)}$ in (2.19) represents the degree of ‘medium run pass-through’ as defined in

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5For notational simplicity, we drop the firm-sector notation here.
Gopinath et al. (2010). The higher is the desired degree of medium run pass-through, the more likely the firm will choose PCP instead of LCP. Take for instance the special case where a) the firm’s elasticity of demand is constant (e.g. the firm has a very small share of the market), and b) the firm’s marginal cost in its own currency is independent of the exchange rate. Then the firm desires to have full exchange rate pass-through, so we have $\text{Cov}(\tilde{p}_{t+j}, \tilde{s}_{t+j}) = -\text{Var}(\tilde{s}_{t+j})$, and the firm will always choose PCP. But when desired pass-through is limited either by exchange rate sensitive movements in its marginal cost, or endogenous movements in its desired markup, then it may optimally choose LCP over PCP.

In our data, the largest fraction of currency invoicing by far is accounted for by the US dollar. But as we see below, for some goods categories, a non-negligible fraction of invoicing is in euro. Condition (2.19) indicates that if a firm chooses PCP pricing of its exported good, it will do so in the currency which has the highest positive covariance with its desired flexible price (in the currency of the importer). From (??), it is clear that the optimal flexible price for the firm will almost certainly have a higher covariance with its own currency that with the currency of another country. Hence, in a natural sense we should expect that European exporters who choose PCP over LCP will invoice in euro rather than any other currency (although this is not guaranteed by condition (2.19)). Unsurprisingly, this is what we find in the data.

Gopinath et al. (2010) outline the sense in which exchange rate pass-through should be higher for PCP firms than LCP firms, even conditional on a price change. In the empirical analysis below, we will investigate the implications of this theory by asking whether exchange rate pass-through, conditional on a price change, is systematically different between goods which are invoiced in Canadian dollars relative to goods invoiced in U.S. dollars or other currencies.

But is there any reason to consider systematic differences in pass-through for US dollar PCP exporters than for euro invoicing exporters? In fact it is likely that exchange rate pass-through for US dollar invoiced exports will be higher, for a number of reasons. First, if pass-through is increasing in market share, as captured by the first line in (2.16), then since the US dominates in size terms for most of the good categories covered in our data, this should increase measured exchange rate pass-through for any sector. Secondly, imported intermediate goods are far more likely to be invoiced in US dollars themselves. To the extent that the presence of imported intermediate goods invoiced in third currencies may reduce the degree of flexible price exchange rate pass-through, this factor will lead to the expectations of a higher exchange rate pass-through for US dollar invoiced exports than those for euro or other currencies.

2.3. Indirect Trade and Exchange Rate Pass-through

For some of the good categories we examine, and particularly for apparel and footwear, there is a large distinction between country of origin and country of export. For instance, in the apparel industry in 2008, 33 percent of imports by shipments came from China, but only 10 percent of shipments were directly exported by China; the rest were exported to Canada mostly through the U.S. (and partly through Hong Kong). What implications does this have for exchange rate pass-through? In our model in the previous subsections, there was no difference between country of export or country of origin.
At least two factors suggest that exchange rate pass-through will be smaller in the case where country of origin and country of export differ. The first is the presence of value added generated by the country of export, for instance due to distribution costs associated with indirect exports. This will reduce pass-through of exchange rate changes in the currency of the country of origin, unless the exchange rates of both countries are perfectly correlated. But the presence of distribution linkages from indirect trade will also directly affect the pricing decision of the original exporter. This is shown in Corsetti and Dedola (2005). Take the following extension to (2.20). Assume that each good sold in the final market requires an additional distribution service in fixed proportion $\eta$. Then as shown by Corsetti and Dedola (2005), the final goods price will be the sum of the original exporters price plus a term associated with the price of the distribution good, which we denote $p_n$. Hence, the extended demand function is given by:

$$x_{ik} = \hat{p}_{ik}^{-\rho} \hat{p}_k^{\rho-\eta} X$$

(2.20)

where $\hat{p}_{ik} = p_{ik} + \eta p_n$ and $\hat{p}_k = \left[ \sum_{i=1}^{N} \hat{p}_{ik}^{-\rho} \right]^{\frac{1}{1-\rho}}$. Following Corsetti and Dedola (2005), it is easy to show that the optimal pricing policy for the firm is given by

$$p_{ik} = \frac{\epsilon_{ik}}{\epsilon_{ik} - 1} \left( s \left[ a w^\alpha s_f^{-\alpha} + (1 - a) \frac{1}{s} \right] + \eta p_n \right),$$

(2.21)

In its pricing decision, the monopolistic competitive firm will take account of the impact of the distribution cost on the elasticity of demand. A rise in the firm’s price will effectively increase the perceived elasticity of demand for the firms product by the final consumer. As a result, the equilibrium markup will fall, and as a result the degree of exchange rate pass-through will be reduced relative to the case without distribution costs. In the expression (2.21), this reduction in pass-through is captured by the additional term $\eta p_n$ on the right hand side of the pricing equation.

The empirical implications of this theory are immediate. Conditional on price change, we should see a higher rate of exchange rate pass-through for goods in which the country of origin is the same as the country of export.

3. Data

We use data from the Canadian Border Services Agency (CBSA) customs data. The data set contains information on every single import/shipment into Canada from July 2002 to August 2008, and is organized at the 10-digit Harmonized System (HS) code. The data is collected by the CBSA and housed at Statistics Canada. It contains information on the total value of each shipment, the number of units shipped, the 10-digit Harmonized System (HS) product code for the good, an importing firm identifier, where the good was produced, the country which finally exported the good directly to Canada, and several other pieces of information that are important for the analysis of exchange rate pass-through.

---

6In this example, we take $p_n$ to be independent of the exchange rate of the country of origin. Distribution costs could be denominated in the currency of the exporter or the currency of the importer.

7This data set is similar to the Argentine import customs data used in Gopinath and Neiman (2013).
including the currency of invoicing of each shipment.

As a proxy for prices, we use unit values defined as total shipment value divided by the number of units.\footnote{There are several issues that arise from using unit values as a proxy for prices, such as the fact that even though the 10-digit HS codes are quite fine, there may still be more than one distinct product in each code, and therefore observed price changes may be due to compositional changes within the 10-digit HS code, rather than changes in the true, underlying prices of individual goods. Moreover, there may be measurement errors in the number of units. These issues are raised in Berman, Martin and Mayer (2012) and Amiti, Itskhoki and Konings (2012) who use similar data. In Section 3, we provide a very specific definition of a product that can be tracked over time that address these issues, to some extent, but the empirical results that we present must be interpreted with the understanding of these possible data limitations.} The shipment values are reported in the currency of invoice, and if this is different than Canadian dollars, a Canadian dollar value is reported using the value of the bilateral exchange rate at the time the good crossed the border. While goods come across the border on a daily basis, we are not provided with an exact date a given shipment crossed the border and are only provided with the month in which the import entered Canada. However, for those goods invoiced in a foreign currency, we can back out an exchange rate specific to the day of the shipment by dividing the Canadian-dollar shipment value by the foreign-currency shipment value. In the empirical analysis below, for shipments priced in Canadian dollars, we match the unit values with the monthly bilateral exchange rate between Canada and the country of export. We are also provided with an identifier for the purchasing company in Canada. Although the actual business number is scrambled, it does allow us to track a single buyer over time.

The data set also provides a value for duty code, which, among other things, lets us know whether a reported import represents a transaction among affiliated companies (intra-firm trade). For our analysis, we drop all of these imports as we want to focus on inter-firm trade, and the model presented above reflects this fact.\footnote{See Neiman (2010) for an analysis of pass-through and intra-firm trade.}

A unique feature of the data set is that it separately identifies the country of origin (where the good was produced) from the country of export (the country from which the good was ultimately shipped to Canada), which will allow us to explore the role of direct versus indirect trade in exchange rate pass-through. In our context, direct trade is when a good is shipped directly from the country of origin to Canada, and so the country of origin is the same as the country of export. Indirect trade, on the other hand, is when a good is produced in one country and shipped to Canada via a third country, so the country of origin is different from the country of export. The determination of the country of origin can be quite complex for some products and is ultimately determined by the WTO rules of origin. In this paper, we assume that the country of origin is the country in which the production of the good originates and has the largest value added to the final product that is shipped into Canada.

In any given month, we observe approximately five million shipments (we have data for 72 months). However, for many of these shipments the unit of measurement is not available. The unit of measurement is needed to calculate the unit value. For this reason, we select a subset of goods representing a wide range of goods that have a unit of measurement reported for at least eighty percent of the observed shipments. The nine product groupings or sectors, along with information on the currency of invoice,
country of origin and country of export, and total number of shipments are provided in Tables 1 and 2.\textsuperscript{10} The products range from commodities (e.g. Vegetable Products), to light manufacturing goods (e.g. Textiles), to heavy manufacturing goods (e.g. Machinery).\textsuperscript{11}

\begin{table}[h]
\centering
\caption{Summary Statistics (Value)}
\begin{tabular}{|l|l|l|l|l|l|l|l|l|l|l|}
\hline
Product & HS Code & Currency of Invoice (%) & Country of Origin (%) & Country of Export (%) & Obs. \\
& & USD & CAD & EUR & 1 & 2 & 3 & 4 & 1 & 2 & 3 & 4 \\
\hline
Vegetable Products & 07-14 & 93.3 & 6.0 & 1.1 & 58.5 & 7.2 & 4.1 & 3.3 & 76.5 & 3.2 & 2.6 & 1.4 & 6,075,397 \\
& & (US) & (MX) & (CL) & (EU) & (US) & (EU) & (GT) & (GB) & (US) & (EU) & (GT) & (GB) \\
Food and Beverage & 16-22 & 64.6 & 1.6 & 33.3 & 60.6 & 33.4 & 1.1 & 0.6 & 61.3 & 33.4 & 1.1 & 0.6 & 3,091,614 \\
& & (US) & (EU) & (GT) & (GB) & (US) & (EU) & (GT) & (GB) & (US) & (EU) & (GT) & (GB) \\
Chemical Products & 28-35 & 86.9 & 9.7 & 3.6 & 50.8 & 12.5 & 5.5 & 4.6 & 56.9 & 10.7 & 5.4 & 3.5 & 2,955,658 \\
& & (US) & (EU) & (AU) & (CN) & (US) & (EU) & (AU) & (CN) & (US) & (EU) & (CN) & (BU) \\
Textiles & 50-60 & 82.1 & 12.2 & 4.5 & 57.9 & 9.4 & 7.7 & 3.8 & 62.8 & 8.8 & 6.2 & 3.6 & 3,488,820 \\
& & (CN) & (US) & (EU) & (CN) & (KR) & (CN) & (US) & (CN) & (KR) & (CN) & (KR) \\
Apparel & 61-62 & 88.3 & 6.5 & 3.6 & 45.7 & 7.1 & 6.7 & 6.2 & 32.3 & 14.8 & 13.1 & 7.0 & 6,681,865 \\
& & (CN) & (BD) & (IN) & (US) & (CN) & (US) & (CN) & (US) & (CN) & (US) & (CN) & (US) \\
Footwear & 64 & 83.1 & 4.4 & 11.9 & 62.1 & 11.9 & 7.3 & 4.9 & 37.6 & 19.3 & 14.8 & 8.7 & 856,652 \\
& & (CN) & (EU) & (CN) & (BR) & (CN) & (US) & (CN) & (US) & (CN) & (US) & (CN) & (US) \\
Metal Products & 72-81 & 91.1 & 6.9 & 1.7 & 62.3 & 9.9 & 6.8 & 4.0 & 67.8 & 8.5 & 5.9 & 4.0 & 6,093,213 \\
& & (US) & (CN) & (EU) & (CL) & (US) & (CN) & (EU) & (CN) & (US) & (CN) & (CN) & (US) \\
Industrial Machinery & 84 & 88.7 & 6.3 & 3.9 & 61.4 & 10.5 & 8.8 & 6.2 & 77.2 & 6.6 & 5.9 & 2.8 & 5,198,218 \\
& & (US) & (CN) & (EU) & (JP) & (US) & (CN) & (EU) & (CN) & (US) & (CN) & (CN) & (US) \\
Consumer Electronics & 85 & 86.1 & 11.2 & 1.0 & 33.2 & 33.0 & 10.0 & 4.4 & 59.6 & 14.5 & 7.9 & 3.4 & 2,955,951 \\
& & (US) & (CN) & (MX) & (KR) & (US) & (CN) & (HK) & (KR) & (US) & (CN) & (HK) & (KR) \\
\hline
\end{tabular}
\end{table}

Note: Within the HS2 ranges provided, some HS2 and HS4 products are dropped due to a lack of units of measurement, and hence an inability to calculate unit values.

Starting with the currency of invoice, it is clear that the majority (often in excess of eighty percent) of goods are priced in U.S. dollars, with the rest largely priced in Canadian dollars and Euros. However, there is variation across the products. Whereas over ninety percent of the value Vegetable and Metal Products are priced in U.S. dollars, only about 65 percent of Food and Beverage products are priced in U.S. dollars, with 33 percent priced in Euros, and only 1.6 percent priced in Canadian dollars. In most other product groups, there are more Canadian-dollar priced goods than Euro-priced goods, with the only other exception being in Footwear, where roughly twelve percent of imports are priced in Euros, versus four percent in Canadian dollars.

Some of the variation in the currency of invoice can be partially explained by which countries are shipping the goods to Canada. As mentioned above, the data allow us to separately identify the country of origin from the country of export, and so Tables 1 and 2 provide information on the percentage of goods coming from the top four countries of origin and and export. For most products, the U.S. is the most important country of origin and country of export. For Vegetable Products, for example, nearly 59 percent of goods originate in the U.S. and nearly 77 percent of imports are either shipped direct from, or via the U.S. For Apparel, the majority (62 percent) of goods are produced in China, with

\textsuperscript{10}The numbers in Table 1 are weighted by the total value of each shipment. Table 2 provides unweighted shipment data.

\textsuperscript{11}In both Tables, the products are defined as a range of HS2 codes. However, within these ranges, some specific HS2 and HS4 products are dropped due to many missing unit of measurement observations.
### Table 2: Summary Statistics (Shipments)

<table>
<thead>
<tr>
<th>Product</th>
<th>HS Code</th>
<th>Currency of Invoice (%)</th>
<th>Country of Origin (%)</th>
<th>Country of Export (%)</th>
<th>Obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>USD</td>
<td>CAD</td>
<td>EUR</td>
<td>1</td>
</tr>
<tr>
<td>Vegetable Products</td>
<td>07-14</td>
<td>95.9</td>
<td>2.1</td>
<td>0.8</td>
<td>69.6</td>
</tr>
<tr>
<td>Food and Beverage Products</td>
<td>16-22</td>
<td>74.6</td>
<td>5.8</td>
<td>13.9</td>
<td>63.5</td>
</tr>
<tr>
<td>Chemical Products</td>
<td>28-35</td>
<td>83.3</td>
<td>12.4</td>
<td>1.5</td>
<td>77.5</td>
</tr>
<tr>
<td>Textiles</td>
<td>50-60</td>
<td>89.5</td>
<td>3.6</td>
<td>5.6</td>
<td>62.7</td>
</tr>
<tr>
<td>Apparel</td>
<td>61-62</td>
<td>66.9</td>
<td>6.3</td>
<td>14.8</td>
<td>27.2</td>
</tr>
<tr>
<td>Footwear</td>
<td>64</td>
<td>78.6</td>
<td>5.8</td>
<td>13.8</td>
<td>49.8</td>
</tr>
<tr>
<td>Metal Products</td>
<td>72-81</td>
<td>93.2</td>
<td>2.5</td>
<td>2.2</td>
<td>71.2</td>
</tr>
<tr>
<td>Industrial Machinery</td>
<td>84</td>
<td>93.1</td>
<td>3.9</td>
<td>1.9</td>
<td>59.4</td>
</tr>
<tr>
<td>Consumer Electronics</td>
<td>85</td>
<td>93.6</td>
<td>2.1</td>
<td>1.8</td>
<td>51.8</td>
</tr>
</tbody>
</table>

Note: Within the HS2 ranges provided, some HS2 and HS4 products are dropped due to a lack of units of measurement, and hence an inability to calculate unit values.

China also being a major country of export (in terms of shipments, the U.S. is the most important country of export). For Food and Beverage products, a significant portion of imports are produced in, and exported direct to Canada by countries in the European Union, which likely explains the high percentage of Euro-priced goods. What is interesting to note is that in many cases, the U.S. exports many more goods than it produces, meaning that many countries ship their good to Canada through the U.S. This is what we refer to a indirect trade. We explore this issue further in the next section by focusing on the Apparel sector.

### 4. Empirical Analysis

#### 4.1. Panel Design: Defining Monthly Prices

In order to measure exchange rate pass-through, it is important that we have a set of goods whose prices we can track over time. In our data, we can observe many imports of the same good in the same month, and even on the same day. These HS10 goods can arrive in Canada from different countries and by purchased by different companies in Canada. Therefore, in the raw data there is no way to track the price of a single good over time. In order to create a price that can be tracked over time and used to analyze issues like the role of currency invoicing and indirect trade in pass-through, we combine price observations in order to define a good price that is importing firm (f), HS10 product (p), country of origin (o), country of export (e), currency (c) and time (t) specific. For clarity of exposition, let $s = \{f, p, o, e, c\}$. We define the price of good $s$ in month $t$ as:

$$ P_{st} = \sum_{i=1}^{n}(\alpha_{ist} \cdot P_{ist}) $$

(4.1)
where \( i \) is an individual transaction (or import) and \( \alpha_{ist} \) is a weight, defined as the relative shipment size to total shipments of the \( fpoec \) good. That is:

\[
\alpha_{ist} = \frac{\text{Shipment}_{ist}}{\sum_{i=1}^{n} \text{Shipment}_{ist}}
\]

(4.2)

where \( \text{Shipment}_{ist} \) is the number of units in each shipment and \( n \) is the total number of imports of good \( i \) in a single month.

In addition, since we have a transaction-specific exchange rate for those goods priced in currencies other than the Canadian dollar (the exchange rate can vary depending on what day of the month a good crosses the border), we can create a \( fpoect \)-specific exchange rate, in a manner similar to the way we created a \( fpoect \)-specific price. For those goods priced in Canadian dollars, there is no implied exchange rate in the data. We therefore match these observations with the monthly bilateral exchange rate between the Canadian dollar and the currency of the exporting country. With this definition of a \( fpoect \)-specific price, we now have a “collapsed” or “condensed” data set for each product that we use in the empirical analysis of exchange rate pass-through.

4.2. Exchange Rate Pass-Through

We start the empirical analysis by obtaining a measure of overall pass-through for each product/sector. To do so, we use the following micro-price pass-through regression:

\[
\Delta \tau p_{st} = c + \beta \Delta \tau e_{st} + Z_{st}' \gamma + \epsilon_{st}
\]

(4.3)

where \( \Delta \tau p_{st} = ln(P_{st}) - ln(P_{st}) \) is expressed in Canadian dollars and \( \tau \) represents the last period in which this price is observed. We have a very specific definition of a good price and a good will not necessarily be imported every period. \( \Delta \tau e_{st} \) is the cumulative change in the log of the nominal exchange rate over the duration for which subsequent imports of good \( s \) are observed. \( Z_{st} \) includes controls for the cumulative change in the foreign consumer price level, the Canadian consumer price level, Canadian GDP, and fixed effects for every \( fpoec \) product. Note that this is a similar set of control variables to that used in Gopinath, Itskhoki and Rigobon (2010), and given that we are looking at cumulative changes in variables over time, this setup up is equivalent to the medium-run pass-through regressions in that paper.

Table 3 presents the results for overall pass-through for each of the nine products/sectors.\(^{12}\) Focusing first on the exchange rate pass-through coefficients, we see that there is a significant amount of variation across the products/sectors. At one extreme, the pass-through coefficient for metal products is 0.970 and significant at the 1% level. At the other end, the pass-through coefficient for Industrial Machinery is 0.168, and it, too, is significant at the 1% level. The other pass-through point-estimates

\(^{12}\)Note these regression are unweighted, i.e. they are not weighted by shipment value.
fall within this range, with pass-through for Food and Beverage and Chemical Products exhibiting near complete pass-through at 0.860 and 0.811, respectively, and consumer electronics at the lower end with a point estimate of 0.348. Vegetables Products, Textiles, Apparel and Footwear come in at 0.573, 0.623, 0.465 and 0.447, respectively.

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Vegetable Products</th>
<th>Food and Beverage</th>
<th>Chemical Products</th>
<th>Textiles</th>
<th>Apparel</th>
<th>Footwear</th>
<th>Metal Products</th>
<th>Industrial Machinery</th>
<th>Consumer Electronics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exchange rate ($\beta_e$)</td>
<td>$0.573^{***}$</td>
<td>$0.860^{***}$</td>
<td>$0.811^{***}$</td>
<td>$0.623^{***}$</td>
<td>$0.465^{***}$</td>
<td>$0.447^{***}$</td>
<td>$0.970^{***}$</td>
<td>$0.168^{***}$</td>
<td>$0.348^{***}$</td>
</tr>
<tr>
<td>(0.021)</td>
<td>(0.031)</td>
<td>(0.032)</td>
<td>(0.023)</td>
<td>(0.014)</td>
<td>(0.039)</td>
<td>(0.036)</td>
<td>(0.032)</td>
<td>(0.049)</td>
<td></td>
</tr>
<tr>
<td>Exporter CPI</td>
<td>-0.296**</td>
<td>0.104</td>
<td>0.567**</td>
<td>-0.001</td>
<td>-0.190***</td>
<td>-0.279*</td>
<td>0.593**</td>
<td>0.303</td>
<td>0.025</td>
</tr>
<tr>
<td>(0.098)</td>
<td>(0.152)</td>
<td>(0.179)</td>
<td>(0.117)</td>
<td>(0.047)</td>
<td>(0.134)</td>
<td>(0.195)</td>
<td>(0.186)</td>
<td>(0.267)</td>
<td></td>
</tr>
<tr>
<td>Canadian CPI</td>
<td>3.217***</td>
<td>1.720***</td>
<td>0.862**</td>
<td>0.690**</td>
<td>0.442***</td>
<td>1.212***</td>
<td>2.105***</td>
<td>0.498</td>
<td>-0.716</td>
</tr>
<tr>
<td>(0.180)</td>
<td>(0.271)</td>
<td>(0.288)</td>
<td>(0.212)</td>
<td>(0.011)</td>
<td>(0.306)</td>
<td>(0.340)</td>
<td>(0.292)</td>
<td>(0.438)</td>
<td></td>
</tr>
<tr>
<td>Canadian GDP</td>
<td>1.984***</td>
<td>2.538***</td>
<td>3.115***</td>
<td>1.171***</td>
<td>-0.447***</td>
<td>0.265</td>
<td>3.560***</td>
<td>-5.178***</td>
<td>0.186</td>
</tr>
<tr>
<td>(0.137)</td>
<td>(0.214)</td>
<td>(0.206)</td>
<td>(0.166)</td>
<td>(0.110)</td>
<td>(0.248)</td>
<td>(0.233)</td>
<td>(0.202)</td>
<td>(0.314)</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-0.008***</td>
<td>0.003*</td>
<td>-0.003*</td>
<td>-0.004***</td>
<td>0.003***</td>
<td>-0.000</td>
<td>-0.015***</td>
<td>-0.007***</td>
<td>-0.006**</td>
</tr>
<tr>
<td>(0.000)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.002)</td>
<td>(0.001)</td>
<td>(0.002)</td>
</tr>
</tbody>
</table>

Note: Each regression includes combined (importing firm)–product–(country of origin)–(country of export)–currency fixed effects.

Most of these findings are in line with the findings for many other countries that pass-through is incomplete. The amount of variation is surprising, and in particular, the low pass-through into Industrial Machinery is interesting given the most imports come from the U.S. and are priced in U.S. dollars.

The coefficient estimates on the cumulative changes in Canadian CPI and GDP are generally positive and significant. Of note, the coefficient on Canadian GDP for Industrial Machinery is large, significant and negative. The coefficient estimates on exporter CPI vary by sign and significance, and it is difficult to identify a pattern.

4.3. Exchange Rate Pass-Through and the Currency of Invoice

Now we move on to test some of the implications of the model. We start with pass-through and the currency of invoice. As documented in Table 1, there is some variation within products/sectors when it comes to the currency of invoice. The model predicts that pass-through rates will be associated with different currency types: exporters that price to market will be more likely to price their goods in Canadian dollars (CAD) and will therefore have lower pass-through to the Canadian-dollar import price; those that price in a foreign currency are less likely to price to market, and therefore pass-through will be higher. The model presented also predicts that pass-through will be higher for goods priced in U.S. dollars (USD) since most of the intermediate inputs used in production are likely to be priced in USD. Goods priced in Euros (EUR), the other major currency used in Canadian imports, are likely to have slightly lower pass-through than USD-priced goods.

To test these hypothesis, we use a similar setup as in (4.3), but we introduce dummies for whether a specific products was priced in Canadian dollars ($D_{CAD}$), U.S. dollars ($D_{USD}$), or Euros ($D_{EUR}$),
and include a full set of interaction terms with the exchange rate:

\[ \Delta_t p_{st} = c + \alpha_1 D_{CAD} + \alpha_2 D_{USD} + \alpha_3 D_{EUR} + \beta_1 \Delta_t e_{st} + \beta_2 [\Delta_t e_{st} \ast D_{CAD}] + \beta_3 [\Delta_t e_{st} \ast D_{USD}] + \beta_4 [\Delta_t e_{st} \ast D_{EUR}] + Z'_{st}\gamma + \epsilon_{st}. \]  

The coefficient \( \beta_1 \) will pick up the degree of pass-through for goods priced in currencies other CAD, USD, and EUR (this is understood to be a very small set of goods). Pass-through to CAD-priced goods will be \( \beta_C = \beta_1 + \beta_2 \), to USD-priced goods it will be \( \beta_U = \beta_1 + \beta_3 \), and to EUR-priced goods \( \beta_E = \beta_1 + \beta_4 \).

Table 4 presents the results of the estimation. Columns 2-6 show the estimates and the standard errors, while columns 7-9 show the difference between the estimates and indicate whether that difference is statistically significant. The results are generally in line with the predictions of the model. For all products/sectors, pass-through is higher for USD-priced goods than for CAD-priced goods and in all but one case (Vegetable Products) the difference between the two estimates is both large and statistically significant. The largest difference between the two pass-through rates is for Chemical Products, where pass-through for USD-priced goods is 0.865 and it is 0.143 (and not significant) for CAD-priced goods. For most products/sectors it is also the case that the rate of pass-through is higher for EUR-priced goods than for CAD-priced goods. For example, in Chemical Products, pass-through to EUR-priced goods is 0.783, which is larger and significantly different from the CAD-priced estimate. There are, however, two exceptions: the CAD-priced pass-through estimate is higher than the EUR-priced estimate for Vegetable Products (but the difference is not significant) and Metal Products (where the difference is large and significant).

**Table 4: Pass-Through and Currency Choice**

<table>
<thead>
<tr>
<th>Product</th>
<th>CA Dollar</th>
<th>US Dollar</th>
<th>Euro</th>
<th>( \beta_C - \beta_U )</th>
<th>( \beta_C - \beta_E )</th>
<th>( \beta_U - \beta_E )</th>
<th>Obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetable Products</td>
<td>0.469 (0.078)</td>
<td>0.587 (0.023)</td>
<td>0.370 (0.102)</td>
<td>-0.118</td>
<td>0.099</td>
<td>0.217**</td>
<td>888,420</td>
</tr>
<tr>
<td>Food and Beverage</td>
<td>0.263 (0.096)</td>
<td>0.941 (0.037)</td>
<td>0.775 (0.089)</td>
<td>-0.678***</td>
<td>-0.512***</td>
<td>0.166*</td>
<td>570,898</td>
</tr>
<tr>
<td>Chemical Products</td>
<td>0.143 (0.108)</td>
<td>0.865 (0.033)</td>
<td>0.783 (0.157)</td>
<td>-0.722***</td>
<td>-0.640***</td>
<td>0.082</td>
<td>921,469</td>
</tr>
<tr>
<td>Textiles</td>
<td>0.179 (0.089)</td>
<td>0.660 (0.027)</td>
<td>0.622 (0.076)</td>
<td>-0.481***</td>
<td>-0.443***</td>
<td>0.038</td>
<td>798,234</td>
</tr>
<tr>
<td>Apparel</td>
<td>0.117 (0.041)</td>
<td>0.584 (0.016)</td>
<td>0.258 (0.029)</td>
<td>-0.467***</td>
<td>-0.141***</td>
<td>0.326***</td>
<td>2,080,897</td>
</tr>
<tr>
<td>Footwear</td>
<td>0.026 (0.119)</td>
<td>0.535 (0.044)</td>
<td>0.182 (0.099)</td>
<td>-0.509***</td>
<td>-0.156</td>
<td>0.353***</td>
<td>224,121</td>
</tr>
<tr>
<td>Metal Products</td>
<td>0.589 (0.133)</td>
<td>1.065 (0.038)</td>
<td>-0.025 (0.150)</td>
<td>-0.476***</td>
<td>0.614***</td>
<td>1.090***</td>
<td>1,145,919</td>
</tr>
<tr>
<td>Industrial Machinery</td>
<td>-0.177 (0.112)</td>
<td>0.187 (0.034)</td>
<td>0.234 (0.169)</td>
<td>-0.364***</td>
<td>-0.411***</td>
<td>-0.047**</td>
<td>1,441,523</td>
</tr>
<tr>
<td>Consumer Electronics</td>
<td>-0.183 (0.180)</td>
<td>0.365 (0.052)</td>
<td>0.715 (0.272)</td>
<td>-0.548***</td>
<td>-0.898***</td>
<td>-0.350</td>
<td>667,273</td>
</tr>
</tbody>
</table>

Note:

Next, there is some evidence supporting the prediction that pass-through will be higher for USD-priced goods than for EUR-priced goods. In seven of the nine industries, \( \beta_U > \beta_E \), and this difference is statistically significant for five of the industries. For two industries, Industrial Machinery and Consumer Electronics, \( \beta_U < \beta_E \), but the difference is very small for the former and statistically insignificant for the latter.
Given that USD is the most common currency in Canadian imports, it is not surprising that the coefficient estimates are USD transactions are closest to the overall pass-through estimates presented in Table 3. Nevertheless, there is some variation in currency within products/sectors, and understanding the relationship between the currency of invoice and pass-through is important for understanding overall pass-through.

4.4. Exchange Rate Pass-Through and Market Share

We now move on to the second prediction of the model: there exists a U-shaped relationship between market share and exchange rate pass-through. That is, starting from a very small market share, as market share increases, the degree of pass-through will decrease, as firms gain some market power, charge higher markups and are able to price to market, to some degree, to maintain market share. At a certain point, market share becomes large enough that a firm need not price to market, at which point the degree of pass-through will begin to increase as market share grows. To test this hypothesis, we run the following regression:

\[
\Delta \tau_{p_{st}} = c + \alpha MS_{oet} + \beta_0 \Delta \tau e_{st} + \beta_1 [\Delta \tau e_{st} * MS_{oet}] + \beta_2 [\Delta \tau e_{st} * MS_{oet}^2] + \beta_3 [\Delta \tau e_{st} * MS_{oet}^3] + Z'_{st} \gamma + \epsilon_{st}
\]

(4.5)

where \(MS_{oet}\) refers to log of the market share of a good produced in country \(o\) and exported by country \(e\) at time \(t\). This term, along with squared and cubed terms, are interacted with the exchange rate to capture the degree of curvature in the pass-through–market share relationship.

Note here that ideally we would have a measure of market share based on the producing firm; however, at this time we do not have an exporting/producing firm identifier in the data. There are data available on the names of the firms in both the country of origin and country of export, but these variables were not initially provided to us. We have requested that they be incorporated into our data. Once this is done, we will be able to create a measure of market share that is firm specific (at least for a subset of firms that we can identify and track over time based on the company name). Until we have these variables, we use a proxy for firm market share by defining market share by the country of origin and export at the HS8 level. For example, an HS8 product produced in China and shipped directly to Canada will have an associated market share that is different from the same HS8 product produced in China, but shipped to Canada via the U.S. While this is certainly a rough proxy for producer/exporting firm-level market shares, we will use this measure until we are provided with the firm name variables.

The results are presented in Table 5. For each product/sector, the coefficient estimates for \(\beta_0\), \(\beta_1\), \(\beta_2\) and \(\beta_3\) can be used, along with varying market shares, to map out the pass-through–market share relationship. In this setup, the coefficient on the cumulative log change in the exchange rate, \(\beta_0\), represents the degree of pass-through if market share is near zero. This coefficient is positive and below one (except for in Metal Products) for all nine products/sectors.
Table 5: Market Share and Pass-Through

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Vegetable Products</th>
<th>Food and Beverage</th>
<th>Chemical Products</th>
<th>Textiles</th>
<th>Apparel</th>
<th>Footwear</th>
<th>Metal Products</th>
<th>Industrial Machinery</th>
<th>Consumer Electronics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Share</td>
<td>-0.052***</td>
<td>-0.064***</td>
<td>-0.085***</td>
<td>-0.054***</td>
<td>-0.019***</td>
<td>-0.021***</td>
<td>-0.074***</td>
<td>-0.063***</td>
<td>-0.055***</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.002)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>Exchange rate</td>
<td>0.863***</td>
<td>0.798***</td>
<td>0.932***</td>
<td>0.770***</td>
<td>0.470***</td>
<td>0.497***</td>
<td>1.178***</td>
<td>0.334***</td>
<td>0.642***</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.052)</td>
<td>(0.060)</td>
<td>(0.038)</td>
<td>(0.018)</td>
<td>(0.052)</td>
<td>(0.059)</td>
<td>(0.049)</td>
<td>(0.070)</td>
</tr>
<tr>
<td>ER*MS</td>
<td>-0.065***</td>
<td>-0.049*</td>
<td>-0.027</td>
<td>-0.088***</td>
<td>0.023***</td>
<td>-0.005</td>
<td>0.007</td>
<td>-0.013</td>
<td>-0.021</td>
</tr>
<tr>
<td></td>
<td>(0.014)</td>
<td>(0.019)</td>
<td>(0.020)</td>
<td>(0.017)</td>
<td>(0.006)</td>
<td>(0.021)</td>
<td>(0.018)</td>
<td>(0.020)</td>
<td>(0.029)</td>
</tr>
<tr>
<td>ER*MS²</td>
<td>-0.021***</td>
<td>0.006</td>
<td>-0.008*</td>
<td>-0.012***</td>
<td>0.004*</td>
<td>-0.006</td>
<td>-0.016***</td>
<td>-0.013***</td>
<td>-0.024***</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.004)</td>
<td>(0.004)</td>
<td>(0.003)</td>
<td>(0.002)</td>
<td>(0.005)</td>
<td>(0.004)</td>
<td>(0.003)</td>
<td>(0.005)</td>
</tr>
<tr>
<td>ER*MS³</td>
<td>0.003***</td>
<td>0.003***</td>
<td>0.002***</td>
<td>0.006***</td>
<td>0.001***</td>
<td>0.001</td>
<td>0.000</td>
<td>0.001</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Exporter CPI</td>
<td>-0.304***</td>
<td>0.035</td>
<td>0.556**</td>
<td>0.025</td>
<td>-0.121*</td>
<td>-0.249</td>
<td>0.690***</td>
<td>0.456*</td>
<td>0.223</td>
</tr>
<tr>
<td></td>
<td>(0.098)</td>
<td>(0.152)</td>
<td>(0.179)</td>
<td>(0.117)</td>
<td>(0.047)</td>
<td>(0.134)</td>
<td>(0.195)</td>
<td>(0.186)</td>
<td>(0.267)</td>
</tr>
<tr>
<td>Canadian CPI</td>
<td>3.123***</td>
<td>1.668***</td>
<td>0.766**</td>
<td>0.653***</td>
<td>0.432***</td>
<td>1.197***</td>
<td>2.265***</td>
<td>0.282</td>
<td>-0.902*</td>
</tr>
<tr>
<td></td>
<td>(0.180)</td>
<td>(0.271)</td>
<td>(0.288)</td>
<td>(0.212)</td>
<td>(0.110)</td>
<td>(0.134)</td>
<td>(0.340)</td>
<td>(0.292)</td>
<td>(0.438)</td>
</tr>
<tr>
<td>Canadian GDP</td>
<td>1.964***</td>
<td>2.588***</td>
<td>3.116***</td>
<td>1.105***</td>
<td>-0.520***</td>
<td>0.223</td>
<td>3.283***</td>
<td>-5.197***</td>
<td>0.069</td>
</tr>
<tr>
<td></td>
<td>(0.138)</td>
<td>(0.214)</td>
<td>(0.205)</td>
<td>(0.166)</td>
<td>(0.089)</td>
<td>(0.248)</td>
<td>(0.233)</td>
<td>(0.233)</td>
<td>(0.315)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.126***</td>
<td>0.148***</td>
<td>0.249***</td>
<td>0.113***</td>
<td>0.004***</td>
<td>0.020***</td>
<td>0.148***</td>
<td>0.124***</td>
<td>-0.088***</td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.004)</td>
<td>(0.005)</td>
<td>(0.003)</td>
<td>(0.001)</td>
<td>(0.002)</td>
<td>(0.004)</td>
<td>(0.004)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>Obs.</td>
<td>888420</td>
<td>570898</td>
<td>921469</td>
<td>798234</td>
<td>2080897</td>
<td>224121</td>
<td>1145919</td>
<td>1441523</td>
<td>667273</td>
</tr>
</tbody>
</table>

Note: Each regression includes combined (importing firm)–product–(country of origin)–(country of export)–currency fixed effects.

The estimates of the coefficients on the interaction terms vary in terms of sign, magnitude and level of significance across all nine products/sectors. In order to get a clear picture of the implied relationship between pass-through and market share, Figure 1 plots market share against pass-through using the estimated coefficients.

There is mixed evidence in support of a U-shaped relationship between pass-through and market share. The U-shaped relationship is evident in for three products/sectors: Food and Beverage, Chemical Products, and Textiles. The low point—at which an increase in market share starts to be associated with an increase in pass-through—varies across these three products/sectors. For Food and Beverage, the relationship becomes positive once market share exceeds roughly six percent. The same numbers for Chemical Products and Textiles are 46 percent and twenty percent, respectively. These results support the prediction of our empirical model and are in line with the findings in Auer and Schoenle (2013) and Garetto (2014), who also find evidence of a U-shaped relationship between pass-through and market share.

The results for Vegetable Products, Footwear, Metal Products, Industrial Machinery, and Consumer Electronics suggest that the degree of pass-through decreases monotonically with increases in market share. This would seem to support the assumption made by Amiti, Itskhoki and Konings (2013), who develop a model that assumes a monotonic relationship and then find support for it in Belgian data. Finally, the Apparel sector stands alone in that pass-through increases monotonically with increases in market share.

All of these results should be interpreted with caution for several reasons. First, our measure of market share based on the country of origin and export at the HS8-product level may not be fine enough
to pick up the mechanisms outlined in our theoretical model. Second, the ability to detect a U-shaped relationship depends on the distribution of market shares in the data. It is possible that for a given product/sector a U-shaped relationship does exist, but no single firm has a big enough market share to put it on the upward-sloping section of the pass-through–market share curve. In this circumstance, no U-shaped relationship would be detected in the data. We therefore take the current results as weak support for the mechanisms outline in our model, and await the data of producing and exporting firm names to provides further evidence.

4.5. Direct versus Indirect Trade

In this section, we explore how pass-through varies depending on how goods arrive in Canada. As outlined in the theoretical model, there is reason to believe that pass-through will be higher for goods shipped directly to Canada from the producing country. To examine this in the data, we focus on a single product/sector: Apparel (HS 61 and 62).\textsuperscript{13} The Apparel sector provides a nice setting for

\textsuperscript{13}Note that in this subsection we use a slightly different cut of the data for Apparel. The majority of Apparel imports are classified by number of goods—i.e. number of t-shirts. However, some are classified by kilograms. In the previous subsections, we kept goods price in numbers and kilograms (and price changes depended on the unit of measurement). In this subsection, we drop those goods whose unit values are in kilograms. We do this to narrow the types of good we are looking at, which is important when studying direct versus indirect trade for a certain set of trading countries. Having said this, most shipments are reported in numbers, and so the number of observations dropped in minimal.
the study of direct versus indirect trade and pass-through. As can be seen in Table 2, while a large portion of all shipments (27.2 percent) originate in China, only 11.7 percent of shipments are shipped directly from China to Canada. Many Chinese goods enter Canada via the United States. Similar trade patterns exist for goods produced in India.

There have also been interesting changes over time in terms of trade partners in the Apparel sector. In the top panel of Table 6, we report the percentage of shipments from a number of export countries (Canada’s six biggest trade partners), as a percentage of total shipments and total value. In the bottom panel of Table 6, we provide similar numbers, but for the country of origin.

**Table 6: Country of Export and Origin (Apparel)**

<table>
<thead>
<tr>
<th>Country/Region of Export</th>
<th>Percentage of shipments</th>
<th>Percentage of value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U.S.</td>
<td>China</td>
</tr>
<tr>
<td>2002</td>
<td>47</td>
<td>6</td>
</tr>
<tr>
<td>2003</td>
<td>47</td>
<td>7</td>
</tr>
<tr>
<td>2004</td>
<td>47</td>
<td>8</td>
</tr>
<tr>
<td>2005</td>
<td>45</td>
<td>10</td>
</tr>
<tr>
<td>2006</td>
<td>48</td>
<td>10</td>
</tr>
<tr>
<td>2007</td>
<td>50</td>
<td>11</td>
</tr>
<tr>
<td>2008</td>
<td>54</td>
<td>10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Country/Region of Origin</th>
<th>Percentage of shipments</th>
<th>Percentage of value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U.S.</td>
<td>China</td>
</tr>
<tr>
<td>2002</td>
<td>25</td>
<td>15</td>
</tr>
<tr>
<td>2003</td>
<td>23</td>
<td>15</td>
</tr>
<tr>
<td>2004</td>
<td>22</td>
<td>18</td>
</tr>
<tr>
<td>2005</td>
<td>17</td>
<td>26</td>
</tr>
<tr>
<td>2006</td>
<td>13</td>
<td>29</td>
</tr>
<tr>
<td>2007</td>
<td>12</td>
<td>33</td>
</tr>
<tr>
<td>2008</td>
<td>12</td>
<td>33</td>
</tr>
</tbody>
</table>

For the country of export, although the U.S. remains Canada’s major trading partner in terms of percentage of shipments throughout the sample period, China is Canada’s biggest trading partner in Apparel in terms of percentage of import value. The European Union accounts for a significant percentage of Canadian apparel imports as an exporter, and its share is relatively stable over time (in both shipments and value). Hong Kong, India and Bangladesh (BD) also show up on the country of export radar and account for single digit shares of apparel shipments. When comparing the top panel (country of export) to the bottom panel (country of origin), it becomes clear that the U.S. accounts for a much larger share as the country of export compared to country of origin, which suggests that there is a significant amount of indirect trade via the U.S. to Canada. Similarly, Hong Kong’s share both in terms of shipment and value is higher as the country of export than country of origin may reflect its role as a trade intermediary re-exporting Chinese products.14

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14Research on the nature of China’s trade with Hong Kong has revealed that a large fraction of Hong Kong’s exports originate from China, and these Hong Kong exporters are often intermediaries (Feenstra and Hanson, 2004).
To further look into how pass-through could differ for direct trade versus indirect trade, we consider the same regression framework as in (4.3), but we restrict the sample to examine different (country of origin)–(country of export)–(currency) combinations. The results are reported in Table 7. The first two sets of results (for the country/region of origin being the U.S. and the E.U.) do not address the issue of direct versus indirect, but show how direct trade varies by currency type. These results confirm the analysis is section 4.2, and show that for goods produced in the U.S. and the E.U. and shipped directly to Canada (as most goods are that are produced in the U.S. and E.U.), pass-through for goods priced in USD is higher than that for goods priced in CAD and EUR. These estimates will serve a baseline estimates for the comparison of direct and indirect trade.

Table 7: Pass-through and Direct versus Indirect Trade (Apparel)

<table>
<thead>
<tr>
<th>Country/Region of Origin</th>
<th>Country/Region of Export</th>
<th>Currency of Invoice</th>
<th>( \beta )</th>
<th>s.e.</th>
<th>Obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>U.S.</td>
<td>USD</td>
<td>0.677</td>
<td>0.033</td>
<td>315,996</td>
</tr>
<tr>
<td>U.S.</td>
<td>U.S.</td>
<td>CAD</td>
<td>0.046</td>
<td>0.162</td>
<td>23,849</td>
</tr>
<tr>
<td>E.U.</td>
<td>E.U.</td>
<td>USD</td>
<td>0.544</td>
<td>0.162</td>
<td>15,089</td>
</tr>
<tr>
<td>E.U.</td>
<td>E.U.</td>
<td>CAD</td>
<td>-0.176</td>
<td>0.070</td>
<td>53,980</td>
</tr>
<tr>
<td>E.U.</td>
<td>E.U.</td>
<td>EUR</td>
<td>0.248</td>
<td>0.033</td>
<td>203,717</td>
</tr>
<tr>
<td>China</td>
<td>China</td>
<td>USD</td>
<td>0.674</td>
<td>0.028</td>
<td>256,929</td>
</tr>
<tr>
<td>China</td>
<td>Hong Kong</td>
<td>USD</td>
<td>0.754</td>
<td>0.032</td>
<td>117,614</td>
</tr>
<tr>
<td>China</td>
<td>U.S.</td>
<td>USD</td>
<td>0.370</td>
<td>0.052</td>
<td>136,861</td>
</tr>
<tr>
<td>India</td>
<td>India</td>
<td>USD</td>
<td>0.858</td>
<td>0.061</td>
<td>72,858</td>
</tr>
<tr>
<td>India</td>
<td>U.S.</td>
<td>USD</td>
<td>0.559</td>
<td>0.137</td>
<td>19,597</td>
</tr>
</tbody>
</table>

Table 7 then provides the results for goods produced in China and shipped to Canada directly, or via Hong Kong or the U.S. For clarity, we focus on the USD-invoiced transactions. What is clear is that the pass-through estimates for products made in China but exported through the U.S. (around 0.4) is much lower than for the goods made in China and directly exported from China or via Hong Kong (around 0.7). Similarly, pass-through for products invoiced in U.S. dollars and made in India but exported through the U.S. (around 0.6) is also lower than for the goods made in India and shipped directly to Canada (around 0.9).

Is it possible that these are different goods that are being shipped directly and indirectly? In order to see if the goods that are exported from the country of origin directly are any different than those shipped indirectly through the U.S., we look at a breakdown of the type of products (at the 3-digit HS level) by country of export and origin in Table 8. At the HS level, there does not appear to be a significant difference in the types of goods imported from each country.

For what seem to be similar products, why are some of them shipped directly from the country of origin to Canada, while others shipped indirectly through the U.S.? It may have something to do with the role of intermediary firms in facilitating trade across borders. For example, a Canadian firm that does not have direct links to Chinese exporters has to rely on U.S. intermediary companies to bring the goods to North America before bringing them into Canada. In this case, the goods are shipped
Table 8: Type of Products by Country of Export and Origin (Apparel)

<table>
<thead>
<tr>
<th>Country of Export</th>
<th>Percentage of shipments</th>
<th>Percentage of value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HS3</td>
<td>U.S. China HK E.U. India BD Other</td>
<td>U.S. China HK E.U. India BD Other</td>
</tr>
<tr>
<td>610</td>
<td>46 9 7 14 5 3 16</td>
<td>15 24 12 3 11 9 25</td>
</tr>
<tr>
<td>611</td>
<td>35 14 12 17 3 2 16</td>
<td>10 32 23 4 5 5 21</td>
</tr>
<tr>
<td>620</td>
<td>51 11 5 14 5 1 13</td>
<td>17 33 12 7 5 4 22</td>
</tr>
<tr>
<td>621</td>
<td>51 11 5 14 5 1 13</td>
<td>17 33 12 7 5 4 22</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Country of Origin</th>
<th>Percentage of shipments</th>
<th>Percentage of value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HS3</td>
<td>U.S. China HK E.U. India BD Other</td>
<td>U.S. China HK E.U. India BD Other</td>
</tr>
<tr>
<td>610</td>
<td>19 21 2 10 7 4 38</td>
<td>7 35 2 2 11 10 32</td>
</tr>
<tr>
<td>611</td>
<td>13 33 5 12 5 3 31</td>
<td>6 50 6 3 5 5 26</td>
</tr>
<tr>
<td>620</td>
<td>14 29 3 15 6 3 30</td>
<td>5 46 3 5 6 7 29</td>
</tr>
<tr>
<td>621</td>
<td>22 28 1 11 7 1 29</td>
<td>9 48 1 6 5 4 28</td>
</tr>
</tbody>
</table>

from China to the U.S., where the customs details and/or extended warehousing and/or (in some cases) transportation to Canada are taken care of by the U.S. intermediary company. For those Canadian companies that have direct trade links with Chinese exporters, the goods are more likely to be shipped directly to Canada. Based on discussions with officials at the Canadian Border Services Agency, this may be linked to firm size and export experience, as larger, more experienced firms are more likely to have contacts (i.e. customs brokers and others to handle logistics) in China that can organize direct shipment (or transshipment) of goods to Canada, whereas smaller importers are more likely to rely on U.S. customs brokers and distributors. We are continuing to look into the connection between firm characteristics and imports in the Canadian apparel industry.

5. Conclusions

We develop a model that provides three predictions about the relationship between exchange rate pass-through and certain firm and product characteristics. First, exchange rate pass-through varies by currency of invoice; second, there is a U-shaped relationship between market share and pass-through; and lastly, the trade route in which a good reaches Canada is associated with different rates of pass-through. This paper remains a work in progress and these empirical results are preliminary. Nevertheless, we find evidence in favor of the three predictions of the model. The evidence is strongest for the pass-through and currency of invoice.
Reference:


Hong, G. H., and Li, N., 2013. Market structure and cost pass-through in retail. mimeo, University of Toronto.


