

Import Switching and the Impact of a Large Devaluation*

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Abstract

In Colombia, from 1998 to 1999, during a large external shock the RER depreciated by 26% and import value dropped 32%. Since imports became more expensive during the devaluation, we would expect increases in exit of firms from the import market as well as larger dropped varieties for continuing firms. However, using detailed firm level import transactions, we find that compared to normal times the value from firms dropped varieties and exit falls. To be sure, we do find that firms use less imported varieties, but its due to fewer adding of new imported varieties rather than more dropping of varieties.

Regarding firms adjustment mechanisms, we find: 1) Most importers add and drop import varieties all the time. 2) Firms add and drop varieties with similar intensity. 3) Both the values of added and dropped products by continuing firms comove negatively with the exchange rate, as does entry and exit. Our findings suggest firms select their imported varieties, and reorganize their imported inputs and production over time. We introduce searching for imported inputs into a model with endogenous choice of import intermediate inputs. Firms search for imported inputs suppliers and reorganize their input usage. With an imported input cost shock, e.g., a devaluation, the benefit from searching new suppliers decreases, which leads to less adding and dropping in firms' imported inputs. Our model focuses on the dynamic aspects of import reorganization, and shows that a devaluation can slow down the import churning and lead to larger TFP declines beyond those previously found. The model predicts more productive firms use more imported inputs, and do more adding and dropping at the same time. During the devaluation, there are fewer firms add and drop import varieties, and if they do, the shares of adding and dropping among their total import decreases. In the data, firm level

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imports switching behavior is consistent with these predictions, and results are robust to controlling for export switching behavior.

1 Introduction

In Colombia, from 1998 to 1999, during a large external shock the real exchange rate depreciated by 26%¹ and import value dropped 32%². As imports became more expensive during the devaluation, we would expect increases in exit of firms from the import market as well as more dropped varieties for continuing firms. However, using detailed firm level import transactions, we find that compared to normal times the value of firms' dropped varieties and exit falls³. To be sure, we find that firms using less imported varieties but this is due to fewer adding of new imported varieties rather than larger dropping of varieties.

This pattern not only occurs in extreme episodes like the motivating one. To show this, we plot the RER together with aggregate adjustment of the three pairs of gross margins: firm entry, and exit; for each continuing firm, the value of new added imported products, and the value of dropped products; the increased value of continuing products, and the decreased value for continuing products⁴. We find falls in aggregate volumes of adding and dropping during depreciation. A remarkably similar pattern appears for entry and exit. The same patterns appear if we use numbers of added and dropped import varieties within firms instead of values. In other words, firms dropped less imported varieties than before, and also added less imported varieties during the devaluation. So again, the fall in aggregate import observed during a depreciation is caused by reductions in margins that contribute positively rather than increases in margins that contribute negatively to import value. We find these results have the flavor of (Shimer 2012), where he reports that unemployment increases are due to falling job finding rates rather than increases in job separation rates.

In a nutshell, we find that gross margins reveal large adjustments that move contrary to the net. Moreover, the gross adjustment is large being at least three times the net. Many firms are acting against our conventional economic intuition by adding new import products and entering import market in a period of devaluation. And firms dropped less imported inputs during devaluation. These facts are puzzling and hard to be explained by models of endogenous choice of imported inputs as (Gopinath and Neiman 2011) and (Halpern, Koren, and Szeidl 2011). The systematic relations we find between the gross margins and RER suggest that the opposite movements are not due to idiosyncratic shocks. Accordingly, in this

¹The reported exchange rate is Colombian pesos to US dollars: US is Colombia's major trading partner and the change is from August 1998 to August 1999.

²The equivalent import value drop for manufacturing firms is 23%.

³The same patterns hold for firms that only import but don't export.

⁴More precisely, we filter quarterly values for the six margins and the RER data to then focus on the trend.

paper we address the question of how are firms adjusting their gross margins, and we propose a model that rationalizes these findings.

A further inquiry into the firm level data shows that the number of firms that only drop are similar to those that only add, and that many more firms actually do both add and drop. Hence, for this last group, we plot the number of products added and dropped by each firm and find a very strong positive correlation, i.e., these firms add just as many products as they drop; so firms are substituting some imported products for others. Furthermore, at the firm level, this adding and dropping is not a small share with an average around 30% of their total import value. During the devaluation, there are fewer firms doing both add and drop, and for firms doing both, the shares of adding and dropping among their total import decreased.

Our findings suggest that firms select their imported varieties and suppliers, and reorganize their imported inputs and production over time. During the devaluation, firms not only use less imported varieties, but also do less adding and dropping of imported inputs. Accordingly, we introduce searching for imported inputs into a model with endogenous choice of imported intermediate inputs based on (Halpern, Koren, and Szeidl 2011). Firms choose to import an endogenous range of inputs depending on input productivity. Over time, importers decide if they want to pay a search cost to be connected with a new bunch of foreign input suppliers. After they pay the search cost, the productivity of new suppliers is realized, and firms adjust the imported input varieties/suppliers.

The theory predicts that searching for new input suppliers and input reorganization increases profits, and the increase in profits is larger for more productive firms. Accordingly, more productive firms pay the searching cost, and add and drop input varieties at the same time. With an imported input cost shock, as would occur in a devaluation, the benefit from searching new suppliers decreases, which leads to fewer firms switching, and less adding and dropping in firms imported inputs. This mechanism reduces manufacturing TFP, not only through firms using fewer varieties, but also through less reallocation within firms toward the most efficient use of inputs.

Finally, we provide further evidence consistent with the predictions of the model. First, more productive firms do more adding and dropping, and in turn import switching improves firm productivity⁵. Second, more productive inputs, measured as those having larger import value, are less likely to be dropped. Third, there is less adding and dropping when the RER is high. Fourth, we confirm that larger firms use more imports, in value and numbers of products. All of this evidence is robust to an exporter dummy and an export switching dummy.

Our paper is related to the recent work on the relationship between firm imports and

⁵ In our data, the gross change is related to firm productivity improvements, but not the net change.

productivity. (Halpern, Koren, and Szeidl 2011) estimate the effects of imported inputs use on total factor productivity for Hungarian firms. (Goldberg, Khandelwal, Pavcnik, and Topalov 2010) find reducing input tariff induces new products. (Amiti and Konings 2007) show that reducing import tariff leads to large productivity gains. (Gopinath and Neiman 2011) study the effects of the Argentine trade collapse during the Argentine currency devaluation. (Bernard, Redding, and Schott 2010) find US manufacturing firms reassign resources by add and drop products, and product switching contributes to a reallocation of resources within firms toward their most efficient use. We find firms adjust their imported inputs, and input adding and dropping is another margin of firms’ adjustment. Our model focuses on the dynamic aspects of input reorganization, and shows that devaluation can slow down input churning and lead to larger TFP declines beyond those previously found.

The remainder of the paper is structured as follows. Section 2 describes our dataset and reports main empirical findings. Section 3 outlines the model. Section 4 shows further evidence on firms level switching that consistent with the model predictions. Section 5 concludes.

2 Data and Empirical Evidence

The manufacturing survey is conducted by the national statistical office, DANE. The survey, called EAM (Encuesta Anual Manufacturera), is a panel and we have data for the period 1994-2009.

The import and export data comes from DIAN, the government tax authority. We have all import (export) transactions from 1994 to 2011 with data on value, quantity, HS code at 10 digits, country of origin (destination) and crucially with NIT, the tax identifier. Using the NIT we keep all manufacturing firms to avoid distributors⁶.

In Colombia, from 1998 to 1999, during a large external shock the RER depreciated by 26%⁷ causing an import value drop of 32%⁸. As we mention in the introduction, during this episode we observe lots of action against conventional economic intuition. We would expect increases in exit of firms from the import market as well as larger values for dropped varieties for continuing firms. However, we do not see that. There are many firms entering the import market at all times and churning value goes down during the devaluation.

In table 1, we highlight dimensions in which (Gopinath and Neiman 2011) did not focus to show the relevance of gross margins. We split changes in imports into 6 dimensions rather

⁶Before restricting our sample to manufacturing firms our dataset aggregates to virtually the same value as the DANE aggregate trade value statistics. Aggregate manufacturing trade closely tracks total Colombian trade and is around 50-60% of total value.

⁷The reported RER is Colombia to US, it’s major trading partner and the change is from August 1998 to August 1999.

⁸The equivalent import value drop for manufacturing firms is 23%.

		a) Net						
		Total	Exit	Entry	Drop	Decrease		
ARG	HS6	-69%	0.11		0.18	0.71		
	HS10xCty	-69%	0.11		0.45	0.44		
COL	HS10	-23%	0.09	-0.04	0.33	0.63		

		b) Gross						
		Total	Exit	Entry	Drop	Add	Decrease	Increase
COL	HS10	-23%	0.09	-0.04	0.59	-0.26	1.28	-.65

Table 1: Net And Gross Shares Of Adjustment Margins Of Aggregate Imports In 1998-1999.

than 3: firm entry, and exit; for each continuing firm, the value of new added imported products, and the value of dropped products; the increased value of continuing products, and the decreased value for continuing products. We define dropped products as products that are never bought by the firm again, whereas added products as those that have never been bought by the firm before⁹; while results are qualitatively the same with a less conservative definition of add and drop, using this definition, we avoid an inventory explanation as in (Alessandria, Kaboski, and Midrigan 2010).

Table 1¹⁰, shows net as well as gross adjustments of import change for the period 1998-1999 in Colombia and compares them to those reported for Argentina. While our import drop is around half of that in Argentina, the adjustment patterns for the net are very similar to the Argentinian case. However, as the gross adjustment patterns show, the net obscures much action. First, notice how gross shares of the fall in aggregate imports reveal large adjustments that move contrary to the net. In particular, entry of firms, added products of continuing firms and increasing value of continuing products for stayers all show values that are close to their corresponding negatively contributing margins.

To analyze the impact of the devaluation, let's first look at how gross margins look in other episode. In figure 1 we report change values for our 3 pairs of adjustment modes during two different episodes: a period of import value increase, 1994/1995, and a period in which there is a fall, 1998/1999. In both episodes, value for entry of firms is close to the exit of firms, value for added products of continuing firms is similar to dropped products, and the increasing value of continuing products is similar to the decreased value. During the depreciation period, 1999, net import value falls because entry, add and increasing value of continuing products

⁹ In case of HS code change, we use detailed documents of HS revisions to create a concordance which is available upon request. For more on this, see section 7.1 in the Empirical Appendix.

¹⁰ The data for Argentina is total trade whereas figures for Colombia represent trade for manufacturing firms.

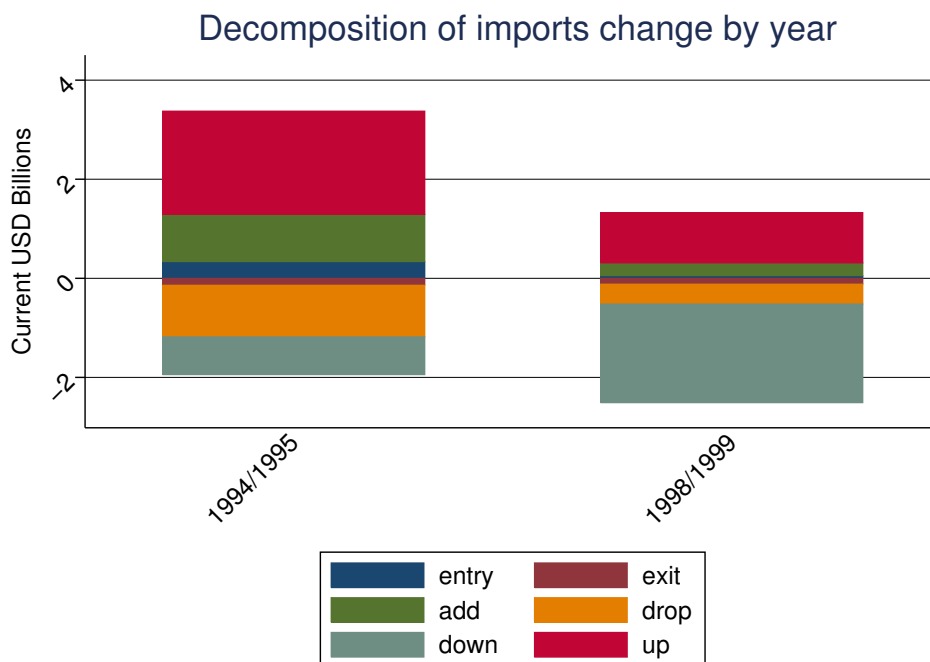


Figure 1: Decomposition of Imports Change.

all fall in value, not because firms dropped a larger value of imported inputs. In both cases, adjustment modes that go against conventional wisdom are not at all negligible in terms of value.

In figure 2 we show the number of firms that use a given adjustment mechanism between 1994/1995 and 1998/1999. It is surprising that the 1999 figure is so similar to 1995 since in the former the RER is larger. During the devaluation one would expect major shifts towards drop and exit. However, we do not see that. We only observe minor differences in the number of firms that only add or enter. Many firms are acting against our conventional economic intuition by adding products and entering in a period of devaluation. The difference between the two episodes is there are fewer firms do both add and drop during devaluation.

Furthermore, we show that this adding and dropping is not a small value at the firm level. Figure 3 presents the average value that firms add(drop) as a fraction of their total imports. These shares are large at around 30% for both margins¹¹. Also note that during the

¹¹ This is the most conservative value, i.e., defining add (drop) as products never used by the firm before (anymore). Using the standard definition, the value is around 50%.

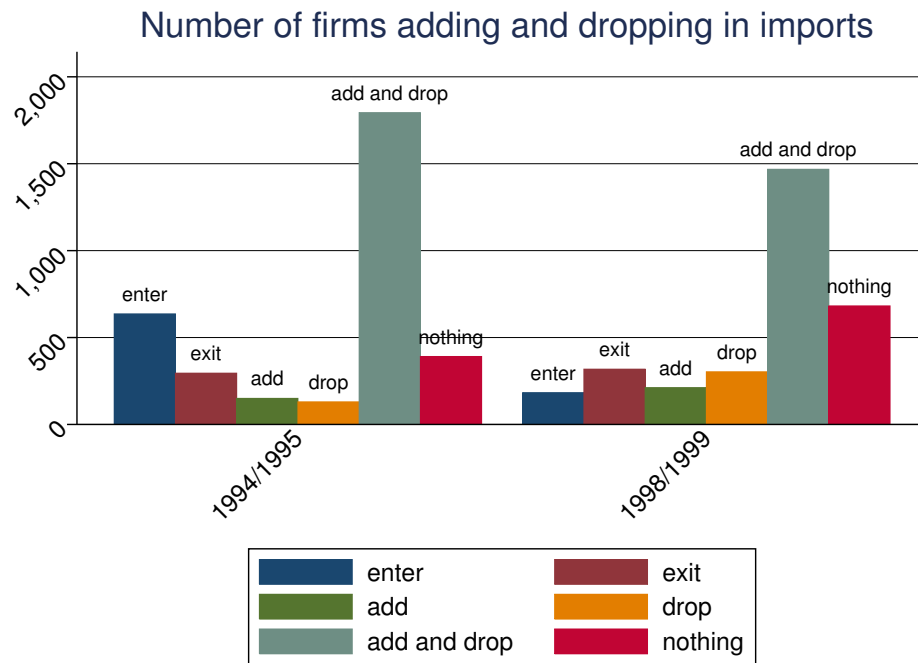


Figure 2: Number Of Firms By Adjustment Mechanism.

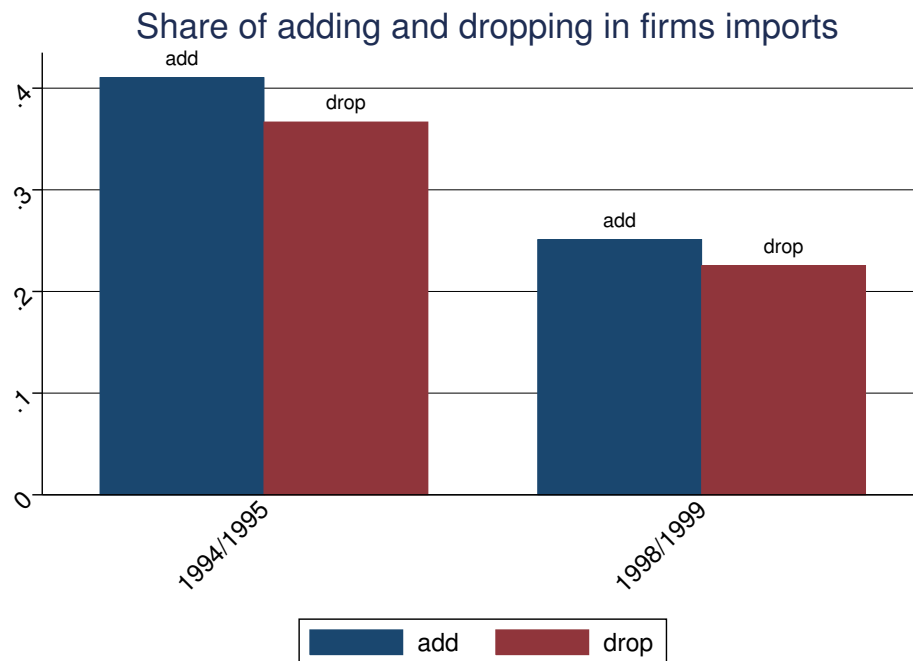


Figure 3: Firm Level Add And Drop Values As Fraction Of Total Import Value.

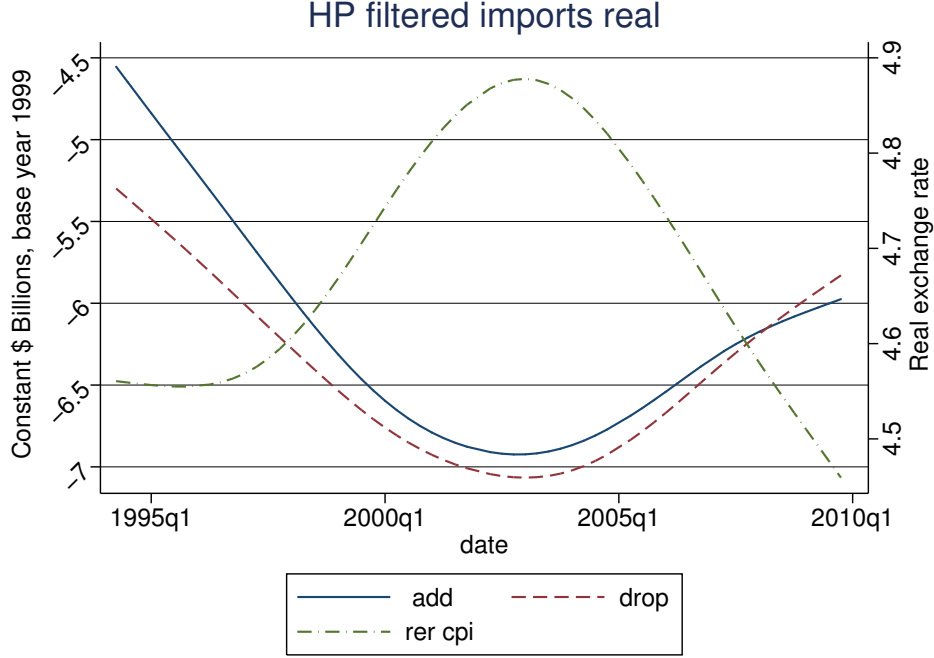


Figure 4: Aggregate Add And Drop Value Against The RER. HP Filtered Data.

devaluation period, both shares fall but more intensely so add which is consistent with the previous evidence.

To relate to the RER formally, we plot it together with aggregate adjustment volumes of the three pairs of margins. In order to study this connection, we filter quarterly values for the six margins and RER data to then focus on the trend¹². We do this because our explanation of the aggregate patterns is going to be about slow moving factors, in particular, technology choice by firms. Figure 4 shows that the value of added and dropped products by continuing firms¹³ comoves negatively with the exchange rate; falls in aggregate volumes of adding and dropping are observed with a depreciation. This pattern is essentially the same when we conduct the same analysis using the average number of added and dropped products across firms. A remarkably similar pattern appears for the remaining 4 margins in figures 6 and 7 in the appendix. The implication is that the fall in aggregate import observed as a consequence of a depreciation is caused by reductions in margins that contribute positively rather than increases in margins that contribute negatively to import value.

¹²More precisely, we take logs first and then apply the HP filter using the conventional value of 1600 for lambda.

¹³Only changes are meaningful in this figure. Levels are not.

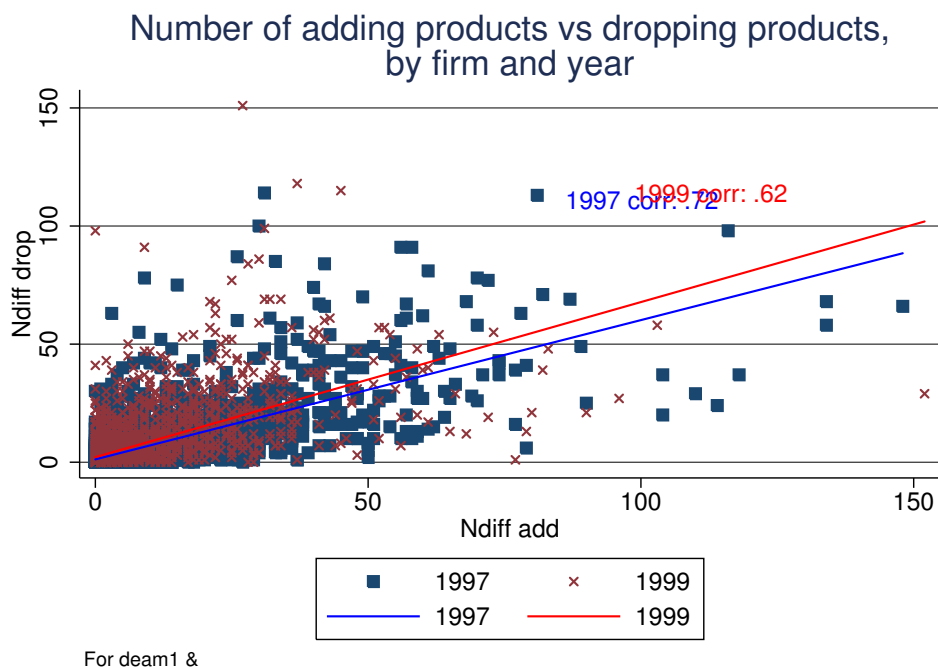


Figure 5: Number Of Products Added And Dropped.

Since a large pool of firms add and drop products simultaneously, on figure 5 we plot the number of products added and dropped by each firm¹⁴. The strong positive correlation found provides evidence that these firms add just as many products as they drop. In this way we rule out an explanation where our results are due to a composition effect, where firms suffer idiosyncratic shocks that make them either add or drop but not both. Contrary to such situation, what we find is that firms are substituting some imported products for others.

All of our results are robust to the exclusion of capital goods. We do that by using the HS codes classified by (Caselli and Wilson 2004) as capital goods.

These findings suggest that firms select their imported varieties and suppliers, and reorganize their imported inputs and production over time. During the devaluation, firms not only use less imported varieties, but also do less churning of imported inputs. In the following section we present a theory of endogenous input selection, where firms search for import inputs suppliers and reorganize their inputs usage over time. We will show the theory predictions, empirical evidence on the relation between firms import switching behavior and their

¹⁴ In table 7 in the Empirical Appendix, we shows how adding and dropping activities are related to firm size. Larger firms do more adding and also more dropping. See section 4 for a regression version of this results.

productivity, and the impact of a large devaluation.

(TBA export switching. To separate the effects of devaluation on export switching and pass on trade, we also look at importers only, and all the results are similar.) In Section 4 we provide further evidence on firms imported input switching behavior that is consistent with model predictions. All of the results are robust to an exporter dummy and an export switching dummy.

3 Baseline Model

To capture the features in the data, we introduce searching for imported inputs into a model with endogenous choice of import intermediate inputs ((Halpern, Koren, and Szeidl 2011)).

3.1 Production and Imported Inputs

The demand firm i face is:

$$q(i) = Dp(i)^{-\rho}.$$

Each firm i produces goods using labor and intermediate inputs,

$$Y_i = A_i L_i^{1-\alpha} X_i^\alpha.$$

Intermediate inputs consist of a bundle of intermediate goods indexed by $j \in [0, 1]$ and aggregated according to a Cobb-Douglas technology:

$$X_i = \exp \left[\int_0^1 \ln X_{ij} dj \right].$$

For each type j of intermediate goods, there are two varieties: home, H , and foreign, M ,

$$X_{ij} = \left[H_{ij}^{\frac{\sigma-1}{\sigma}} + (b_{ij} M_{ij})^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}$$

where σ is the elasticity of substitution between the home and foreign varieties in the production function. $b_{ij} > 1$ measure the productivity advantage of the foreign varieties j in producing i .

We focus on the imports variety decision and ignore firms entry and exit for now. Firms know their productivity A . Furthermore, to import n varieties firms need to pay a fixed cost of $n^\eta F$ units of labor. We assume $\eta > 1$ so the cost function is convex on the number of varieties as in (Gopinath and Neiman 2011). Unlike them, each input productivity has a distribution $f(b)$, with support over $(1, \infty)$. After the imported inputs productivity is realized, firms decide their imported input bundle. Given this setup, firm i would use all the home inputs,

and some foreign inputs which depend on the trade off between productivity advantage and convex cost of importing. Assume home varieties have price p_H and foreign varieties have the same price εp_F .

3.2 Firms Problem

For a firm with productivity A , after the imported input productivity realized, he decides which foreign inputs to use:

$$\min_{L, \Omega, \{H_j, F_j\}} \left\{ wL + \int_0^1 p_H H_j dj + \int_{\Omega} \varepsilon p_F M_j dj + |\Omega|^\eta wF \right\}$$

such that:

$$Y = AL^{1-\alpha} X^\alpha$$

$$X = \exp \left[\int_0^1 \ln X_j dj \right] \quad (1)$$

$$X_j = \left[H_j^{\frac{\sigma-1}{\sigma}} + (b_j M_j)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} \quad (2)$$

We guess the solution is that firm use imported inputs that have productivity larger than b^* . By law of large numbers, there are $f(b)$ fraction of inputs draw productivity equal b .

$$X = \exp \left[\int_0^1 \left(\ln \left[1 + I(im) \left(b_j \frac{p_H}{\varepsilon p_F} \right)^{\sigma-1} \right]^{\frac{1}{1-\sigma}} \right) dj \right] = \exp \left[\int_{b^*}^{\infty} \ln \left[1 + \left(b \frac{p_H}{\varepsilon p_F} \right)^{\sigma-1} \right]^{\frac{1}{1-\sigma}} f(b) db \right].$$

And the measure of inputs firm would use is $\int_{b^*}^{\infty} f(b) db$.

Solving the firm problem¹⁵, we can express his unit cost, λ , as

$$\lambda = \frac{C}{A} G(b^*)^{-\alpha}.$$

where $C = \left(\frac{w}{1-\alpha} \right)^{1-\alpha} \left(\frac{p_H}{\alpha} \right)^\alpha$, $G(b^*) = \exp [\alpha \int_{b^*}^{\infty} (\ln B) f(b) db]$ and $B = \left[1 + \left(b \frac{p_H}{\varepsilon p_F} \right)^{\sigma-1} \right]^{\frac{1}{\sigma-1}}$. So the unit cost depends on firm's productivity A , the home country factor costs C , and the benefit from using more productive foreign inputs $G(b^*)$. Notice that more foreign inputs, implied by a lower cutoff, reduces the marginal production cost.

If the firm uses imported inputs in Ω , and produce output Y , his total cost is,

$$\lambda Y + |\Omega|^\eta wF,$$

¹⁵See Theoretical Appendix for a detailed derivation of the model.

and so maximizes net profits given by:

$$\max_{Y, b^*} \left(\frac{Y}{D} \right)^{-\frac{1}{\rho}} Y - \lambda Y - m(b^*)^\eta w F$$

where $m(b^*) = \int_{b^*} f(b) db$.

The two first order conditions are for optimal output and the cutoff b^* . Plugging the former into the latter, we have that the marginal input¹⁶ satisfies,

$$\alpha D \left(\frac{\rho - 1}{\rho} \right)^\rho \left(\frac{C}{A} \right)^{1-\rho} G(b^*)^{\alpha(\rho-1)} \ln B^* = \eta m(b^*)^{\eta-1} w F. \quad (3)$$

Adding more imports, i.e., a smaller b^* , increases the benefit from using more productivity foreign inputs $G(b^*) = \exp [\alpha \int_{b^*} (\ln B) f(b) db]$, hence the unit cost is lower. Moreover this way the firm faces higher demand. On the other hand, using more imports incurs an increasing fixed cost.

Profits are $\frac{1}{\rho-1} \lambda Y - m(b^*)^\eta w F$. Using the FOC for b^* , profits can be written as

$$\pi = m(b^*)^{\eta-1} w F \left(\frac{1}{\rho-1} \frac{\eta}{\alpha \ln B^*} - m(b^*) \right). \quad (4)$$

3.3 Switching

At period 2, importers decide if they want to pay a searching cost F_s to be connected with a new bunch of foreign supplier of input varieties. If they pay the sunk cost, they get a new draw for each input produced in the foreign country. For each input, firms choose to import from the more productive suppliers. Suppose the optimal inputs set for a firm is Ω_1 at time 1 and Ω_2 at time 2. Firm may add a variety if $b_{j1} \notin \Omega_1$ and $b_{j1} \in \Omega_2$ (won't be the case) or $b_{j2} \in \Omega_2$. The firm may also keep a variety if $b_{j1} \in \Omega_1$ and b_{j1} or $b_{j2} \in \Omega_2$, he may drop a variety if $b_{j1} \in \Omega_1$ and $b_{j1} \notin \Omega_2, b_{j2} \notin \Omega_2$.

We assume $f(b)$, the productivity distribution for each supplier is a Frechet distribution, which will give us close form solutions¹⁷,

$$F(b) = \exp \left(-T(b-1)^{-\theta} \right)$$

The maximum of two draws for a variety has the distribution with parameter $2T$. Letting small a denote firm age, the distribution would be $f_a(b)$ with parameter aT (if firms always choose to pay F_s). The total profit change if they search for new suppliers is $\frac{d\pi}{da}$, and the firm

¹⁶There is a unique b^* if the second order condition is negative. See Theoretical Appendix for parameter restriction.

¹⁷ The model can be simulated for more general distributional assumptions.

will pay to search for new draws if it is larger than wF_s . We next turn to a summary of the solution.

3.4 Solution

To summarize, at age a , firm with productivity A , uses inputs that have productivity larger than a cutoff b_a^* that satisfies,

$$\alpha D \left(\frac{\rho - 1}{\rho} \right)^\rho \left(\frac{C}{A} \right)^{1-\rho} G(b_a^*)^{\alpha(\rho-1)} \ln B_a^* = \eta m(b_a^*)^{\eta-1} wF, \quad (5)$$

and search for new draws if

$$\frac{d \left(m(b^*)^{\eta-1} \left(\frac{1}{\rho-1} \frac{\eta}{\alpha \ln B^*} - m(b^*) \right) wF \right)}{da} \geq wF_s \quad (6)$$

Note that given parameters $\left(\alpha, C, \rho, \sigma, \eta, w, F, F_s, \frac{p_H}{\varepsilon p_F}, T, \theta \right)$, for each firm A , we can solve the optimal imports cutoff b_a^* , $a = 1, 2, 3 \dots$

3.5 Propositions

Our first proposition addresses the well known fact, also present in our data, that more productive firms use more imported inputs.

Proposition 1 *More productive firms use more inputs.*

Proof. See Theoretical Appendix in section 6.2.

$$\frac{db_a^*}{dA} < 0,$$

so when firm productivity increases, the input cutoff decreases and the firm uses more inputs¹⁸.

■

One of the key features we find in the data is that firms are simultaneously adding and dropping imported varieties. Our model generates such behavior by combining search of better inputs with the possibility of dropping those that are less productive. The next proposition shows this feature of the model analytically.

Proposition 2 *If firms pay the search costs to find new suppliers, they will add and drop varieties simultaneously .*

¹⁸Note the productivity distribution of imported inputs also shifts to the right.

Proof. See Theoretical Appendix in section 6.3. $\frac{db^*}{da} > 0$, searching new suppliers raises the cutoff. Some original inputs should be dropped, but the measure of imported inputs increases. So if firms paid the search cost, they add and drop imported inputs simultaneously. ■

Proposition 3 *Searching new input suppliers increases profits. And the increased profits are larger for more productive firms. Hence, larger firms are more likely to do add and drop.*

Proof. See Theoretical Appendix in section 6.4. $\frac{d\frac{d\pi}{da}}{dA} > 0$, so more productive firms are more likely to pay the search cost. When firms want to find better imported inputs they pay a fixed cost to reorganize production and search. Once paid that fixed cost, their variable cost function improves which allows them to sell more. The benefit is larger for more productive firms, they are more likely to pay the search cost, and more likely to add and drop varieties. ■

Conditional on a given firm productivity, because some inputs are more productive than others, the former are likely to stay longer within a firm than the latter. The next proposition deals with this intuition formally.

Proposition 4 *Conditional on importing, the higher an inputs productivity, the lower the probability of it being dropped.*

Proof. See Theoretical Appendix. ■

Our evidence uses RER variation to document that adding and dropping is reduced during a devaluation in Colombia. And the net imports fall. In our model firms do adding and dropping, and during devaluation, they use less imported inputs.

Proposition 5 *In a devaluation firms use less imported inputs.*

Proof. See Theoretical Appendix in section 6.5. $\frac{db^*}{d\varepsilon} > 0$, then when ε increases, the productivity cutoff increases, firms use less imported inputs. ■

The last proposition shows that the number of firms that add and drop decreases with a RER devaluation.

Proposition 6 *When the currency devaluates, less firms would like to pay the search costs to find new suppliers. Moreover, conditional on paying the cost there firms do less dropping.*

Proof. See Theoretical Appendix in section 6.6. Because $\frac{d(\frac{d\pi}{da})}{d\varepsilon} < 0$, the change of profit from searching is lower when the currency devaluates as imports have become more expensive. Accordingly, fewer firms would pay these searching cost. Therefore, fewer firms would add and drop simultaneously. Furthermore, $\frac{(\frac{db^*}{da})}{d\varepsilon} < 0$ which implies the number of dropping varieties falls in a devaluation. ■

4 Evidence On Firms Import Switching Behavior

In this section we provide further evidence on firms imported input switching behavior that is consistent with model predictions. Available in the Empirical Appendix, we show that all of the results in this section are robust to an exporter dummy and an export switching dummy¹⁹. We run 5 regressions, each of which is associated with a proposition in the Section 3:

In Proposition 1 we show that more productive firms use more imported inputs. Accordingly we run,

$$M_{it} = \alpha_t + \gamma_i + \beta productivity_{t-1} + \varepsilon_{it}$$

where M_{it} is import value or number of different variety of firm i in time t . α_t and γ_i are time and firm fixed effects.

	(1)	(2)
	log_v_imports	log_ndiff
L.log-productivity	0.0380***	0.0176***
	(6.60)	(7.99)
N	38785	38785

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2: Import Level And Productivity At The Firm Level.

In table 2, we run import value or the number of different imported varieties on lagged firm size²⁰. We proxy firm productivity with sales²¹, and do so throughout this section. Consistent with the model and the literature, we find that more productive firms import more.

¹⁹ If a firm does not export we set export switching dummy equal to zero.

²⁰ All variables are in logs in this section.

²¹ Other measures available soon.

We next turn to Proposition 3 which states that larger firms gain more through more intense reorganizing. That is, larger firms will do more intense switching so there will be more adding and dropping²². We run,

$$\Delta M_{it} = \alpha_t + \gamma_i + \beta productivity_{t-1} + \varepsilon_{it}$$

where ΔM_{it} is the gross change: value(number) of added inputs and value(number) of dropped inputs.

	(1)	(2)	(3)	(4)
	log_v_add_imp	log_v_drop_imp	log_ndiff_add	log_ndiff_drop
L.log-productivity	0.0210**	0.0310***	0.0120***	0.0191***
	(3.10)	(4.02)	(4.29)	(6.46)
<i>N</i>	26943	27050	26943	27050

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3: Adding And Dropping Imported Inputs And Firm Productivity.

Results are reported in table 3. We find positive coefficients so more productive firms add and drop more, both in terms of value and number of varieties.

In Proposition 3 we show that the gross change of inputs matters for firms productivity growth. In particular, a key prediction of the model is that firms that pay the fixed cost of switching engage in adding and dropping which in turn improves their productivity and sales. Accordingly, we run,

$$\Delta Y_{it} = \alpha_t + \gamma_i + \beta_1 Changeofinputs_{it} + \varepsilon_{it}$$

where Y_{it} is sales and $Changeofinputs_{it}$ can be either value or numbers.

²² The model also predicts that larger firms are more likely to do switching. This prediction is the extensive margin version of the result in table 3. To confirm that, we run a linear probability model and we get a positive slope on productivity no matter how we define the switching dummy; we use 3 definitions: add vs do nothing, drop vs do nothing, and either add or drop vs do nothing. We also control for firm and year fixed effects.

	(1)	(2)	(3)	(4)
	change_log_prod	change_log_prod	change_log_prod	change_log_prod
L.log_productivity	-0.671*** (-8.57)	-0.670*** (-8.56)	-0.671*** (-8.56)	-0.670*** (-8.55)
log_gross_margin_val	0.0500*** (3.52)			
log_net_margin_val		0.0167 (1.86)		
log_gross_margin_ndiff			0.129*** (3.80)	
log_net_margin_ndiff				0.00116 (0.91)
<i>N</i>	23355	23355	23355	23355

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4: Productivity Growth And Gross Vs Net Import Change.

In table 4 we obtain results consistent with the prediction. Notice how gross changes for both value and number of varieties are positively associated with changes in sales; also, note how the net has lower economic significance than the equivalent gross variable. Furthermore, unlike the gross, the net is statistically insignificant.

Next, we show how, within firms, the likelihood of dropping an input is related to its productivity. This is shown in proposition 4. In our model, searching allows productivity of inputs to improve over time. If the productivity draw of an input was large, the firm will use relatively more of it, and it will be more difficult that a better draw is obtained; hence that product will be kept. To test this hypothesis, we run,

$$DummyDrop_{i,j,t} = \alpha_t + \gamma_i + \beta_1 ImportValue_{i,j,t-1} + \beta_2 TotalImports_{i,t-1} + \varepsilon_{i,j,t}$$

where $DummyDrop_{ijt}$ is a dummy for whether input j was dropped or not, 1 and 0 respectively, $ImportValue_{ijt}$ is the imported value of input j , $TotalImports_{it}$ is total value of imports by firm i at time t . Table 5 shows the results, which are in accordance with the theory: Larger import value for an intermediate is associated with a lower dropping likelihood.

	(1)
	product drop dummy
L.product imports value	-5.03e-09*** (-4.54)
L.firm imports value	-4.63e-11*** (4.38)
<i>N</i>	807020

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: Imported Input Dropping Relation to its Productivity.

The last prediction we test is Proposition 6, which shows that, during the devaluation, less firms were doing add and drop, and each firm was doing less add and drop. Our specification for the later prediction²³ is,

$$\Delta M_{it} = \gamma_i + \beta_1 productivity_{t-1} + \beta_2 RER_t + \varepsilon_{it}$$

where ΔM_{it} is the gross change: value(number) of added inputs and value(number) of dropped inputs. Results in table 6 show that adding and dropping falls when the RER²⁴ goes up, ie, during the devaluation. We interpret this as firms reducing their reorganizing activities as a consequence of input prices going up.

²³ The former prediction is the extensive margin: fewer firms do switching during a devaluation. To confirm that, we run a linear probability model and we get a negative slope on the RER no matter how we define the switching dummy; we use 3 different definitions: add vs do nothing, drop vs do nothing and either add or drop vs do nothing.

²⁴ RER_t is the US-Colombia, RER with base year 1992.

	(1)	(2)	(3)	(4)
	log_v_add_imp	log_v_drop_imp	log_ndiff_add	log_ndiff_drop
L.log-productivity	0.0211** (3.09)	0.0509*** (5.75)	0.00951*** (3.39)	0.0273*** (7.81)
rer	-2.287*** (-20.90)	-3.556*** (-32.54)	-0.606*** (-12.64)	-1.361*** (-29.17)
<i>N</i>	26943	27050	26943	27050

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6: Import Switching and RER.

5 Conclusion

To analyze the impact of devaluation on firms imports, we look at the change of firms import varieties during the devaluation in Colombia. We observe that many firms exited from imports market and many firms dropped some imported varieties, but we also observe many firms entered, and those who dropped imports varieties added new varieties at the same time. This leads us to compare firms import switching behavior during devaluation with other normal episode. We find most of firms add and drop import varieties all the time. During the devaluation, they actually dropped fewer varieties than the normal time, but the new varieties they added are even less, which caused the fall in their imports varieties.

We introduce searching for imported inputs into a model with endogenous choice of imported intermediate inputs. Firms search for imported inputs suppliers and reorganize their input usage over time. With an imported input cost shock, e.g., a devaluation, the benefit from searching new suppliers decreases, which leads to less adding and dropping in firms imported inputs. The model predicts that more productive firms use more imports, they benefit more from searching new imports suppliers, and do add and drop simultaneously. In a devaluation, fewer firms add and drop varieties, and for firms do add and drop, the value of adding and dropping decrease. We find the relations between import switching and firms size are consistent with the model predictions. (To be continued.)

6 Theoretical Appendix

6.1 Firms' Problem

The Lagrangian for the firm problem in the main text is:

$$L = wL + \int_0^1 p_H H_j dj + \int_{\Omega} \varepsilon p_F M_j dj + |\Omega|^\eta wF + \lambda (Y - AL^{1-\alpha} X^\alpha) + \psi \left[X - \exp \left[\int_0^1 \ln X_j dj \right] \right] \\ + \int_{\Omega} \chi_j \left[X_j - \left[H_j^{\frac{\sigma-1}{\sigma}} + (b_j M_j)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} \right] dj$$

Guess that the solution is that firms use imported inputs that have productivity larger than b^* . By the law of large numbers, because there are $f(b)$ fraction of inputs draw productivity equal b . $\int_0^1 \left(\ln \left[1 + I(im) \left(b_j \frac{p_H}{\varepsilon p_F} \right)^{\sigma-1} \right]^{\frac{1}{1-\sigma}} \right) dj = \int_{b^*}^\infty \ln \left[1 + \left(b \frac{p_H}{\varepsilon p_F} \right)^{\sigma-1} \right]^{\frac{1}{1-\sigma}} f(b) db$. And the measure of inputs the firm would use is $\int_{b^*}^\infty f(b) db$.

Solving this problem, we get for intermediate good j :

$$X_j = \frac{\lambda \alpha Y}{p_H \left[1 + \left(b_j \frac{p_H}{\varepsilon p_F} \right)^{\sigma-1} \right]^{\frac{1}{1-\sigma}}} \text{ if } M_j > 0,$$

and firm unit cost is

$$\lambda = \frac{1}{A} \left(\frac{w}{1-\alpha} \right)^{1-\alpha} \left(\frac{\exp \left[\int_0^1 \ln p_H dj \right]}{\alpha \exp \left[\int_{b^*}^\infty \ln \left[1 + \left(b \frac{p_H}{\varepsilon p_F} \right)^{\sigma-1} \right]^{\frac{1}{\sigma-1}} f(b) db \right]} \right)^\alpha.$$

Define $C = \left(\frac{w}{1-\alpha} \right)^{1-\alpha} \left(\frac{p_H}{\alpha} \right)^\alpha$, $G(b^*) = \exp \left[\alpha \int_{b^*}^\infty (\ln B) f(b) db \right]$, and $B = \left[1 + \left(b \frac{p_H}{\varepsilon p_F} \right)^{\sigma-1} \right]^{\frac{1}{\sigma-1}}$ to obtain unit cost as

$$\lambda = \frac{1}{A} C G(b^*)^{-\alpha}.$$

Firm's total cost is then:

$$\lambda Y + |\Omega|^\eta wF,$$

and firm maximizes net profits:

$$\begin{aligned} & \max_{Y,b} \left(\frac{Y}{D} \right)^{-\frac{1}{\rho}} Y - \lambda Y - |\Omega|^\eta wF \\ & = \max_{Y,b} \left(\frac{Y}{D} \right)^{-\frac{1}{\rho}} Y - \lambda Y - m(b^*)^\eta wF, \end{aligned}$$

where $m(b^*) = \int_{b^*}^{\infty} f(b) db$.

The two first order conditions are

$$Y = \left(\frac{\rho - 1}{\rho} \right)^\rho D \lambda^{-\rho}$$

and

$$-\frac{d\lambda}{db} Y - \eta m^{\eta-1} m' wF = 0$$

This last condition can be written as

$$\begin{aligned} & -\frac{d\lambda}{db} Y - \eta m^{\eta-1} f(b^*) wF = -Y \frac{C}{A} (-\alpha) G(b^*)^{-\alpha-1} G'(b^*) + \eta m^{\eta-1} f(b^*) wF \\ & \alpha Y \frac{C}{A} G(b^*)^{-\alpha-1} \left(G(b^*) (-1) \ln \left[1 + \left(b^* \frac{p_H}{\varepsilon p_F} \right)^{\sigma-1} \right]^{\frac{1}{\sigma-1}} f(b^*) \right) + \eta m^{\eta-1} f(b^*) wF = 0, \end{aligned}$$

Using a more compact form, the marginal input satisfies:

$$\alpha Y \frac{C}{A} G(b^*)^{-\alpha} \ln B^* = \eta m(b^*)^{\eta-1} wF$$

and using the FOC for Y becomes 3 in the main text:

$$\alpha D \left(\frac{\rho - 1}{\rho} \right)^\rho \left(\frac{C}{A} \right)^{1-\rho} G(b^*)^{\alpha(\rho-1)} \ln B^* = \eta m(b^*)^{\eta-1} wF \quad (7)$$

By rewriting the above equation, we obtain the next equation which will be the basis of our proofs:

$$\alpha D \left(\frac{\rho - 1}{\rho} \right)^\rho \left(\frac{C}{A} \right)^{1-\rho} G(b^*)^{\alpha(\rho-1)} \ln B^* - \eta m(b^*)^{\eta-1} wF \quad (8)$$

To check the property of the optimal b^* we differentiate 8. The second order condition is

negative as long as

$$\alpha D \left(\frac{\rho-1}{\rho} \right)^\rho \left(\frac{C}{A} \right)^{1-\rho} G(b^*)^{\alpha(\rho-1)} f(b^*) \left(\alpha(\rho-1) (\ln B)^2 f(b^*) - \frac{\left(\frac{p_H}{\varepsilon p_F} \right)^{\sigma-1} b^{*\sigma-2}}{\left[1 + \left(b^* \frac{p_H}{\varepsilon p_F} \right)^{\sigma-1} \right]} \right) \dots$$

$$-\eta(\eta-1)m^{\eta-2}(f(b^*))^2 wF < 0$$

which occurs if η is large enough. In that case the optimal b^* is unique.

The profit is

$$\pi = \frac{1}{\rho-1} \lambda Y - m(b^*)^\eta wF,$$

and $Y = \left(\frac{\rho-1}{\rho} \right)^\rho D P^{\rho-1} \lambda^{-\rho}$, so

$$\pi = \frac{1}{\rho-1} D \left(\frac{\rho-1}{\rho} \right)^\rho \left(\frac{C}{A} \right)^{1-\rho} G(b^*)^{\alpha(\rho-1)} - m(b^*)^\eta wF,$$

which using 7 can be written as

$$\pi = \frac{1}{\rho-1} \frac{\eta m(b^*)^{\eta-1} wF}{\alpha \ln B^*} - m(b^*)^\eta wF = m(b^*)^{\eta-1} wF \left(\frac{1}{\rho-1} \frac{\eta}{\alpha \ln B^*} - m(b^*) \right). \quad (9)$$

This is another key equation in our proofs. The total profit change if they search for new suppliers is $\frac{d\pi}{da}$, and the firm will pay to search for new draws if it is larger than wF_s , i.e.,

$$m(b_{a+1}^*)^{\eta-1} wF \left(\frac{1}{\rho-1} \frac{\eta}{\alpha \ln B^*} - m(b_{a+1}^*) \right) - m(b_a^*)^{\eta-1} wF \left(\frac{1}{\rho-1} \frac{\eta}{\alpha \ln B^*} - m(b_a^*) \right) > wF_s \quad (10)$$

6.2 Proof of proposition 1

Proof. From equation 8, $\frac{d(8)}{db^*} > 0$ and $\frac{d(8)}{dA} > 0$. So $\frac{db^*}{dA} = -\frac{\frac{d(8)}{dA}}{\frac{d(8)}{db^*}} < 0$.

$$\frac{db_a^*}{dA} < 0,$$

so when firm productivity increases, the input cutoff decreases and the firm uses more inputs. ■

6.3 Proof of proposition 2

Proof. From equation 8, $\frac{d(8)}{db^*} > 0$, because $SOC = -\frac{d(8)f(b)}{db} = -\frac{d(8)}{db} f(b)$ and

$$\begin{aligned}
\frac{d(8)}{da} &= \alpha D \left(\frac{\rho-1}{\rho} \right)^\rho \left(\frac{C}{A} \right)^{1-\rho} \ln B^* \alpha (\rho-1) G(b^*)^{\alpha(\rho-1)-1} \frac{dG(b^*)}{da} - \\
&\quad \cdots \eta (\eta-1) m(b^*)^{\eta-2} w F \frac{dm(b^*)}{da} = \\
&\alpha D \left(\frac{\rho-1}{\rho} \right)^\rho \left(\frac{C}{A} \right)^{1-\rho} \ln B^* \alpha (\rho-1) G(b^*)^{\alpha(\rho-1)} \alpha \int_{b^*} \ln B \frac{df(b)}{da} db - \\
&\quad \cdots \eta (\eta-1) m(b^*)^{\eta-2} w F \int_{b^*} \frac{df(b)}{da} db
\end{aligned} \tag{11}$$

Looking at the second term we notice that using more inputs, improves productivity but increases marginal costs as well. $\frac{d(8)}{da}$ can be positive or negative. If η big enough, it is negative. Since $\frac{db^*}{da} = -\frac{\frac{d(8)}{da}}{\frac{d(8)}{db^*}} > 0$, searching new suppliers increases cutoff. Some original inputs should be dropped, but the measure of imported inputs increases. So if firm paid the search cost, they add and drop imported inputs simultaneously. ■

6.4 Proof of proposition 3

1. Searching new input suppliers increases profits.

Proof.

$$\begin{aligned}
\frac{d\pi}{da} &= \frac{\partial \pi}{\partial b^*} \frac{\partial b^*}{\partial a} + \frac{\partial \pi}{\partial a} = \frac{\partial \pi}{\partial a} \Big|_{b_a^*} = \\
&\alpha D \left(\frac{\rho-1}{\rho} \right)^\rho \left(\frac{C}{A} \right)^{1-\rho} G(b^*)^{\alpha(\rho-1)-1} \frac{dG(b^*)}{da} - \eta m(b^*)^{\eta-1} w F \frac{dm(b^*)}{da} = \\
&\alpha D \left(\frac{\rho-1}{\rho} \right)^\rho \left(\frac{C}{A} \right)^{1-\rho} G(b^*)^{\alpha(\rho-1)} \int_{b^*} \ln B \frac{df(b)}{da} db - \eta m(b^*)^{\eta-1} w F \int_{b^*} \frac{df(b)}{da} db = \\
&\frac{\eta m(b^*)^{\eta-1} w F}{\ln B^*} \int_{b^*} \ln B \frac{df(b)}{da} db - \eta m(b^*)^{\eta-1} w F \int_{b^*} \frac{df(b)}{da} db = \\
&\eta m(b^*)^{\eta-1} w F \int_{b^*} \left(\frac{\ln B}{\ln B^*} - 1 \right) \frac{df(b)}{da} db > 0
\end{aligned}$$

where the 3rd equality uses equation 9, and the 5th equation 7.

2. The increased profit from searching new suppliers is larger for more productive firms.
For this part of the proof start using the intermediate step derived above,

$$\frac{d\pi}{da} = \alpha D \left(\frac{\rho-1}{\rho} \right)^\rho \left(\frac{C}{A} \right)^{1-\rho} G(b^*)^{\alpha(\rho-1)} \int_{b^*} \ln B \frac{df(b)}{da} db - \eta m(b^*)^{\eta-1} w F \int_{b^*} \frac{df(b)}{da} db$$

Now, take derivatives wrt A,

$$\frac{d\frac{d\pi}{da}}{dA} = \alpha D \left(\frac{\rho-1}{\rho} \right)^\rho (\rho-1) A^{\rho-2} C^{1-\rho} G(b^*)^{\alpha(\rho-1)} \int_{b^*} \ln B \frac{df(b)}{da} db > 0$$

■

6.5 Proof of proposition 5

Proof. From equation 8, $\frac{d(8)}{db^*} > 0$,. We also have

$$\begin{aligned} \frac{d(8)}{\varepsilon} &= \alpha D \left(\frac{\rho-1}{\rho} \right)^\rho \left(\frac{C}{A} \right)^{1-\rho} G(b^*)^{\alpha(\rho-1)} \dots \\ &\left(\frac{-\left(b^* \frac{p_H}{p_F}\right)^{\sigma-1} \varepsilon^{-\sigma}}{1 + \left(b^* \frac{p_H}{p_F}\right)^{\sigma-1}} + \ln B_a^* \alpha (\rho-1) \int_{b^*} \frac{-\left(b \frac{p_H}{p_F}\right)^{\sigma-1} \varepsilon^{-\sigma}}{1 + \left(b \frac{p_H}{p_F}\right)^{\sigma-1}} f(b) db \right) < 0 \end{aligned}$$

Since $\frac{db^*}{d\varepsilon} = -\frac{\frac{d(8)}{db^*}}{\frac{d(8)}{d\varepsilon}} > 0$, then when ε increases, the productivity cutoff increases, firms use less imported inputs. ■

6.6 Proof of proposition 6

Proof. Equation 10 states the condition under which firms search for new draws. Taking a as continuous,

$$\begin{aligned} \frac{d\left(\frac{d\pi}{da}\right)}{d\varepsilon} &= \frac{d\left(\eta m(b^*)^{\eta-1} w F \int_{b^*} \left(\frac{\ln B}{\ln B^*} - 1\right) \frac{df(b)}{da} db\right)}{d\varepsilon} = \frac{d\eta m(b^*)^{\eta-1} w F \int_{b^*} \left(\frac{\ln B}{\ln B^*} - 1\right) \frac{df(b)}{da} db}{db^*} \frac{db^*}{d\varepsilon} = \\ &\left(\eta(\eta-1) m^{\eta-2} m'^{\eta-1} w F \left(\int_{b_a^*} \ln B \frac{df_a(b)}{da} db \right) \frac{\left(\frac{p_H}{\varepsilon p_F}\right)^{\sigma-1} b_a^{*\sigma-2}}{(\ln B_a^*)^2 \left[1 + \left(b_a^* \frac{p_H}{\varepsilon p_F}\right)^{\sigma-1}\right]} \right) \frac{db_a^*}{d\varepsilon} = \\ &\left(-\eta(\eta-1) m^{\eta-2} f(b_a^*) w F - \eta m^{\eta-1} w F \left(\int_{b_a^*} \ln B \frac{df_a(b)}{da} db \right) \frac{\left(\frac{p_H}{\varepsilon p_F}\right)^{\sigma-1} b_a^{*\sigma-2}}{(\ln B_a^*)^2 \left[1 + \left(b_a^* \frac{p_H}{\varepsilon p_F}\right)^{\sigma-1}\right]} \right) \frac{db_a^*}{d\varepsilon} < 0 \end{aligned} \quad (12)$$

because $\frac{db_a^*}{d\varepsilon} > 0$. The change of profit from searching is lower when the currency devaluates as imports have become more expensive. Accordingly, fewer firms would pay the searching cost. ■

7 Empirical Appendix

7.1 Harmonized System Code

There are changes of product classification over time by the Harmonized Commodity Description and Coding system, which would create pseudo variety adding and dropping by firms. We create a correspondence using the document that specify during 1993-2012, the date when a Decree was approved, the code that it affected and how it affected it, and the date when the change was applied.

We look at the most conservative case by defining dropped products as products that are never bought by the firm again, whereas added products as those that have never been bought by the firm before. Our algorithm uses the concordance and compares the varieties in the current quarter with all the previous quarters to find added varieties, and with all the following quarters to find dropped varieties within each firm.

7.2 Extra Figures and tables

Quantile	Total	Add	Drop	Net	Add share	Drop share
1	6.04	2.19	2.17	0.57	0.63	0.36
2	7.55	2.85	2.67	0.82	0.65	0.36
3	12.67	4.80	4.25	1.49	0.62	0.35
4	52.25	15.28	14.49	8.11	0.47	0.33
Total	20.98	6.67	6.26	2.97	0.58	0.34

Table 7: Number Of Different Products By Quantile. Average Over 1994-2009.

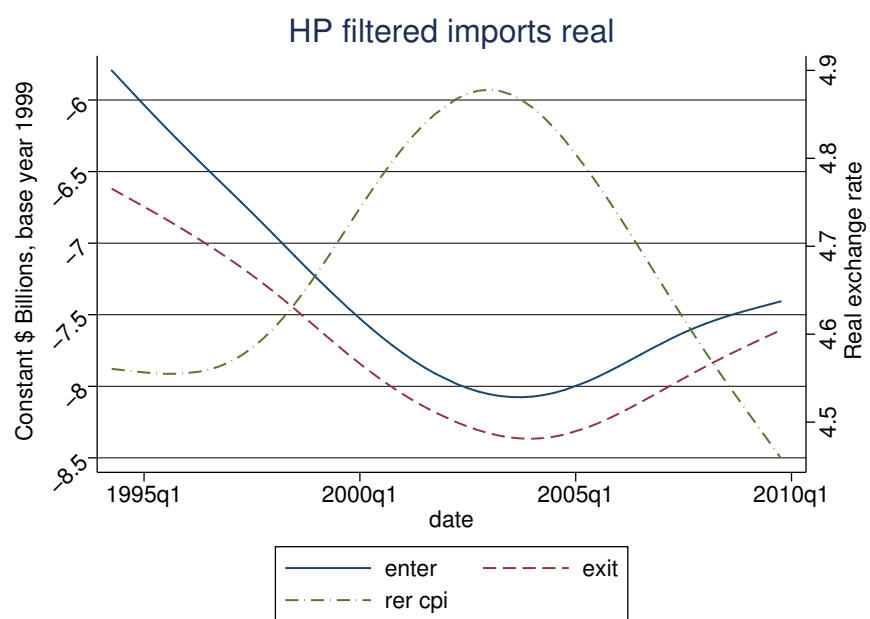


Figure 6: Aggregate Entry And Exit Value Against The RER. HP Filtered Data.

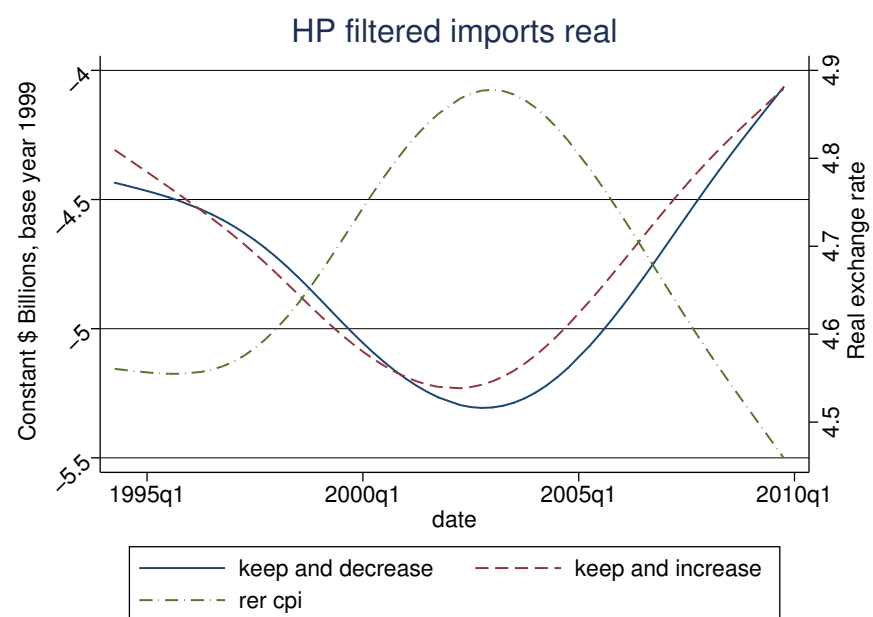


Figure 7: Aggregate Continuing Products Value Against The RER. HP Filtered Data.

	(1)	(2)
	log_v_imports	log_ndiff
L.log_productivity	0.0374*** (6.56)	0.0172*** (7.93)
exporter_switch	1.808*** (13.7)	0.134*** (11.33)
<i>N</i>	38787	38787

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8: Import Level And Productivity At The Firm Level.

	(1)	(2)	(3)	(4)
	log_v_add_imp	log_v_drop_imp	log_ndiff_add	log_ndiff_drop
L.log-productivity	0.0230*** (3.37)	0.0308*** (4.01)	0.0119*** (4.24)	0.0190*** (6.46)
exports_switch	0.0940** (2.58)	0.165*** (4.01)	0.0989*** (6)	0.0109*** (6.84)
<i>N</i>	26667	27021	26667	27021

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9: Adding And Dropping Imported Inputs And Firm Productivity.

	(1)	(2)	(3)	(4)
	change_log_prod	change_log_prod	change_log_prod	change_log_prod
L.log_productivity	-0.666*** (-8.24)	-0.6665*** (-8.24)	-0.639*** (-8.9)	-0.665*** (-8.23)
exports_switch	0.0322 (0.77)	0.0347 (0.84)	0.0227 (0.55)	0.0359 (0.87)
log_gross_margin_val	0.0478** (3.32)			
log_net_margin_val		0.016 (1.79)		
log_gross_margin_ndiff			0.128*** (3.77)	
log_net_margin_ndiff				0.000137 (0.12)
<i>N</i>	23148	23148	23148	23148

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 10: Productivity Growth And Gross Vs Net Import Change.

	(1)	(2)	(3)	(4)
	log_v_add_imp	log_v_drop_imp	log_ndiff_add	log_ndiff_drop
L.log_productivity	0.0199** (2.9)	0.0502*** (5.70)	0.00803** (2.85)	0.0268*** (7.8)
rer	-1.925*** (-17.22)	-3.504*** (-32.05)	-0.478*** (-9.75)	-1.337*** (-28.66)
exports_switch	-0.029 (-0.79)	0.217*** (5.88)	0.0264 (1.58)	1.36*** (8.52)
<i>N</i>	26667	26667	26667	26667

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 11: Import Switching and RER.

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