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Abstract

This article offers a new empirical explanation to the smooth adjustment of employment to openness at the industry level, observed in recent years in developing countries and some of the developed countries. In fact, we challenge the view through which trade is related to employment via a sole substitution effect. Using an oligopoly setting in international segmented markets, we show that each of both imports and exports, carry out an additional demand effect that is always positive on labor demand in a typical industry. We demonstrate that imports can be introduced into two alternative theoretical equations of labour demand that are easily testable and capable to discriminate between a (negative) substitution effect and a (positive) effect of demand. Empirical results seem to be robust to the existence of that 'double' effect for most of the industries in the OECD and developing countries.

JEL: F1, J3 and O2

Keywords: Liberalization, Employment, Competition

Outline:

Non-technical summary:

In the literature studying the effect of trade on employment, substitution has been more documented in the OECD countries (Trefler, 2001; Gaston and Trefler, 1997; Revenga, 1992) while the pro-competitive effect was more emphasized in the developing economies (Harrison and Hanson, 1999) that opened up to trade. We show that substitution and pro-competitive type mechanisms can be retrieved together (not alternatively) in the OECD and developing countries, once the equation of employment is correctly specified to take both of them into account. Especially, we argue that the pro-competitive effect has a *positive* impact on labour demand, neglected by the literature, through an increase in total demand for the traded good. The mechanism is rather intuitive: imports reduce commodity prices, thus increasing total demand. This demand expansion benefits all of the firms, should they be foreign or domestic. Consequently, domestic production and thus the number of domestic employees should rise. The issue is then whether such effect is sizeable and how it can be isolated in empirical studies.

We use a simple oligopoly framework and show that it has two particular features: it enables us to find a linear expression for the growth of labour demand that depend on characteristics related to domestic but also foreign market structures in a typical industry. More interestingly, it is able to discriminate in theory as well as econometrics, between the substitution and the demand effects on employment. In particular, we show that the labour demand equation can be re-expressed in two alternative ways where the import variable can be first introduced to express a substitution effect that is negative on employment, while in a second relation the same vector reveals a demand effect, positive on labour demand.

Empirical results obtained from two group of developed and developing countries support the existence of that 'double' effect for most of the selected industries. Imports appear to carry a pure substitution effect, negative and statistically significant in the first-type labour equation. However, in the second-type equation the same variable seem to be robustly associated with a demand effect as it is positively and significantly related to employment. These conclusions are highly relevant for economic policy: trade liberalization no longer needs to completely rely on general equilibrium mechanisms, hardly convincing when it is to explain some of the virtues of openness.

1 Introduction

The relation between trade and employment has not aroused the same interest than that between openness and wages. The first reason is purely theoretical. In general equilibrium, traditional trade frameworks usually assume perfect labour markets, and labour adjustments are expected to take place between industries to achieve full employment. The second reason is empirical. There has been an urgent need to investigate whether trade was responsible for the observed inequalities in the United States and United Kingdom in the last decades.

Yet, in continental Europe inequalities remained relatively stable throughout the same period but the region had to cope instead with high unemployment. This convinced a few researchers to study the theoretical impact of openness on employment (e.g. Krugman (1995) and Davis (1996)). However, using a CGE-type model, Krugman showed that trade accounts only for 1.4% of the fall in European employment. Some studies, built on the factor content of trade,[1] reach usually the same type of outcome although when relaxing the assumption of perfect substituability between domestic and foreign goods, trade was shown to be significantly harming labor (Wood (1995)).

In sum, the fears from trade openness did not show much support when looking at the effect on *aggregate* employment in the OECD economies. However, industry based studies do not always tell the same story. The basic theoretical concept behind these studies is related to substitution in partial equilibrium: openness to imports should harm *industrial* employment by substituting the services of foreign factors to those of domestic ones in a given sector; on a symmetrical basis, exports should benefit the latter. Some work on Canada and the United States do find some evidence that imports, reduction in tariffs and/or non tariff barriers at the industry level affect sectoral employment (See for instance Trefler (2001), Gaston and Trefler (1997), Revenga (1992), Freeman and Katz (1991)). In Europe though, employment did not adjust much because of the existence of high intra industry trade flows (See Brülhart and Hine (1999)).

Following a similar reasoning, one would expect that in more specialized developing economies, trade liberalization would be more harmful for employment, at least in some disadvantaged industries. In their review of the work undertaken on developing countries, Harrison and Hanson (1999) report that this is not the case. They even qualify the lack of response of employment in developing countries as one of the three remaining puzzles consecutive to trade liberalization. They claim that the adjustment was elsewhere. Openness would have affected instead profits and, to a lesser extent wages, via a pro-competitive effect mechanism, leaving output and employment figures relatively stable[2].

All in all, at the sectoral or firm level, substitution has been more documented in the OECD countries while the pro-competitive effect was more emphasized in the developing economies that opened up to trade. In this article we follow this partial equilibrium type literature leaving aside general equilibrium mechanisms that have already been emphasized in various CGE studies. We show that substitution and pro-competitive type mechanisms can be retrieved together (not alternatively) in the OECD and developing countries, once the equation of employment is correctly specified to take both of them into account. Especially, we argue that the pro-competitive effect has a *positive* impact on labour demand, neglected

[1]See for instance Borjas *et al* (1996), Sachs and Shatz (1994) for the United States, Bonnaz, Courtot and Nivat (1994) and Cortes, Jean and Pisany-Ferry (1997) for France.

[2]These conclusions are based in particular on the work undertaken by Revenga (1997) on Mexico and Harrison and Currie (1997) on Morocco.

by the literature, through an increase in total demand for the traded good. The mechanism is rather intuitive: imports reduce commodity prices, thus increasing total demand. This demand expansion benefits all of the firms, should they be foreign or domestic. Consequently, domestic production and thus the number of domestic employees should rise. The issue is then whether such effect is sizeable and how it can be isolated in empirical studies[3].

That 'double' effect applies to industrial exports as well. By replacing the host country sales, exports affect positively the demand for factor services in the source country. This is the (reverse) substitution effect. Incidentally, due to the strengthening of competition generated by openness, this positive impact is reinforced by a higher demand for all commodities in the host market.

We use a simple oligopoly framework and show that it has two particular features: it enables us to find a linear expression for the growth of labour demand that depend on characteristics related to domestic but also foreign market structures in a typical industry. More interestingly, it is able to discriminate in theory as well as econometrics, between the substitution and the demand effects on employment. In particular, we show that the labour demand equation can be re-expressed in two alternative ways where the import variable can be first introduced to express a substitution effect that is negative on employment, while in a second relation the same vector reveals a demand effect, positive on labour demand.

Empirical results obtained from two group of developed and developing countries support the existence of that 'double' effect for most of the selected industries. Imports appear to carry a pure substitution effect, negative and statistically significant in the first-type labour equation. However, in the second-type equation the same variable seem to be robustly associated with a demand effect as it is positively and significantly related to employment. These conclusions are highly relevant for economic policy: trade liberalization no longer needs to completely rely on general equilibrium mechanisms, hardly convincing when it is to explain some of the virtues of openness.

The rest of the paper is organized as follows: Section 2 presents some stylized facts. Sections 3 and 4 outline the theory to be applied. In section 5 we present the data whereas section 6 emphasize the econometric results. The last section concludes.

2 Stylised facts

How are employment series related to trade indicators at the industry level in developed and developing countries? We use two UNIDO databases related to trade and activity to construct a dataset on 65 countries and 29 industries for the 1981-1997 period[4]. Figure 1 reports industry variations in employment in relation to import values in each of the developed countries. These industry variables, expressed in logarithms, are constructed in terms of variations to the means over the period. Such variables have the advantage to sweep out inter-industry variations letting the figures express only intertemporal variations. Hence, the observed trend should be interpreted as a mean intra-industry trend in each country.

[3]It is worth noting that the paper does not consider the *total* impact of imports (substitution + demand) on industry employment. Put differently, we shall not be examining here the *overall* effect of imports and leave this issue opened for future research but concentrate on how to isolate each of the effects in econometrics.

[4]Details of construction of the dataset can be found in the appendix together with tables 7 and 8 that illustrate the data.

Following that figure, we observe that the relation between imports and employment is positive in general[5]. This observation which is inconsistent with the traditional intuition may be explained however by the insufficient disaggregation of the observed industries. In fact, within each observed industry, a typical country could be specializing in a range of products and thus exporting them while importing products that it does not produce or more generally in which it does not have a comparative advantage. This assumption is consistent with figure 3 in appendix, where exports are positively linked to employment.

However, in order to exclude the corresponding impact of trade in *different* products within highly aggregated industries, we focused instead on the same relation on a smaller panel of homogenous goods' industries where imported goods are expected to be similar to domestically produced ones. We choose 4 industries producing a high proportion of homogenous goods as in the classification of Olveira-Martins (1994) and Rauch (1996) : Paper and Products, Other Non Metallic Products, Iron and Steel and Non Ferrous Metals. Surprisingly, figure 4 in the appendix shows that imports are still significantly and positively related to employment.

Figures 2, and 5 shown in appendix, present the studied link between the openness indicators and employment prevailing in the developing economies. Despite two observations (Honduras and Bolivia), the relationship is either positive (in 22 cases) or not significant (in 27 cases). More striking is the persistence of the same positive effect in these countries when considering only the case of homogenous good industries (see figure 6 in appendix). Finally, from figure 5, we observe that the relation between the volume of exports and employment is not often positive however, with a strict negative effect in some cases[6].

Finally, we replace the import variable by the import penetration rate and plot it against employment. Import penetration measures the ratio of imports to total demand (or apparent consumption). By doing so, we are trying to see what is the corresponding relation between imports and employment *holding demand constant*. We find that the relationship is less clear when the penetration rate instead of the import variable, is confronted to employment (see figures 7 and 8 in appendix). It appears to be insignificant in general in the developed and developing countries.[7] But more interestingly, employment appears to be negatively linked to the penetration rates for 12 developing countries. In fact, these figures suggest that when controlling for the market size (or total demand), the relation between industrial employment and imports ends up to be less positive, non significative or even negative.

These stylized facts invite to focus on the role of market size in the trade's impact on employment. We show in what follows, that beside the substitution effect, imports could reduce prices due to enhanced competition or efficiency in the market. Total demand could increase in return, benefiting for both types of producers domestic and foreigners. Thus, the *total* effect

[5]It is important to note that we have also plotted figures by pair industry-country samples that could be provided upon request. The relations are not always similar to those 'average-tendency' figures presented here. In particular, we have consistent results with the work undertaken previously on Canada and the U.S. where in some industries we observe a decline in employment in relation to an increase in imports over the considered period.

[6]See figures related to Equator, Honduras, Nigeria, Venezuela, Bolivia, Zimbabwe, Egypt and Trinidad and Tobaggo in the appendix.

[7]Note that the positive relation persists only for a small minority of them.

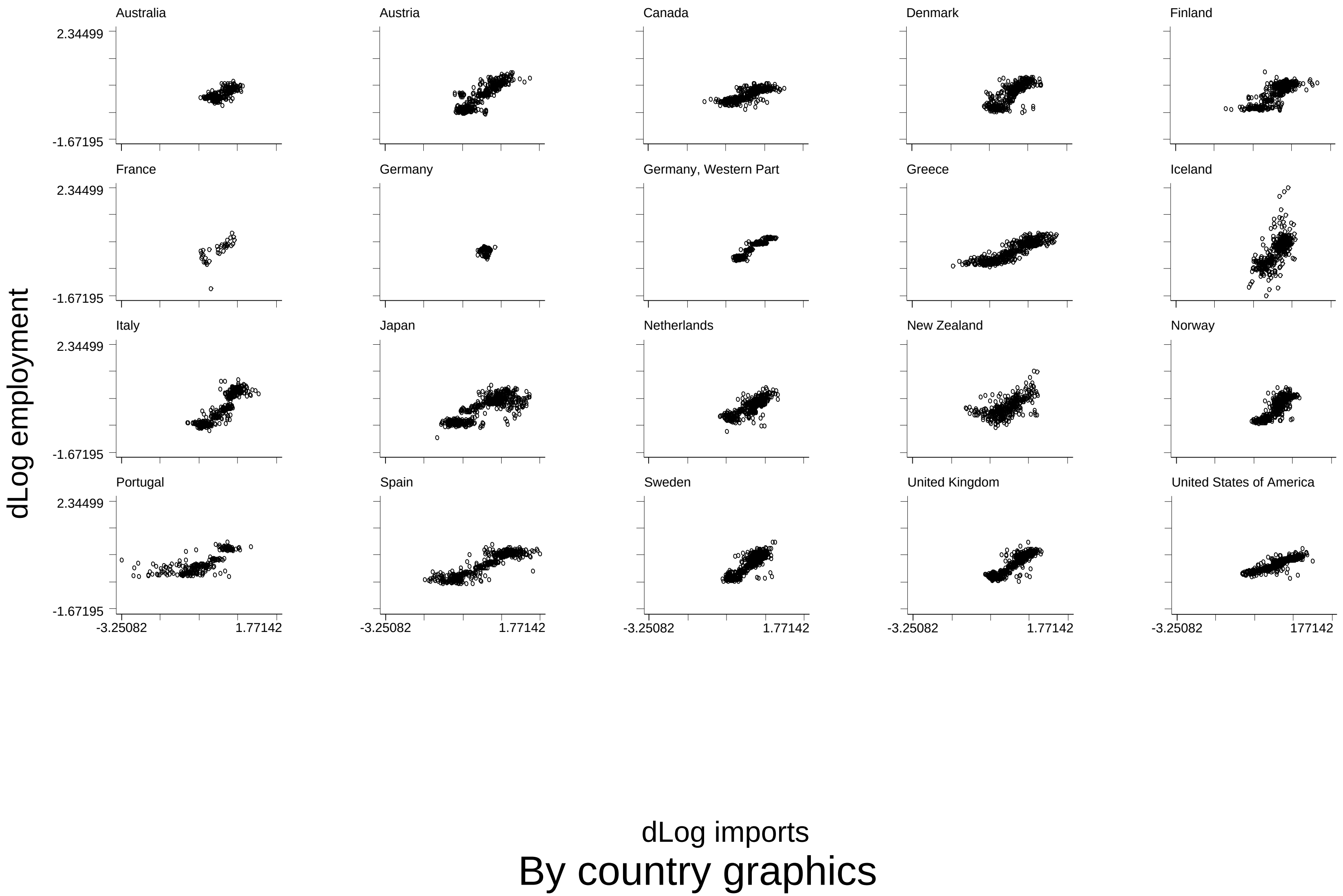

Figure 1: Industrial changes in employment related to imports in OECD countries

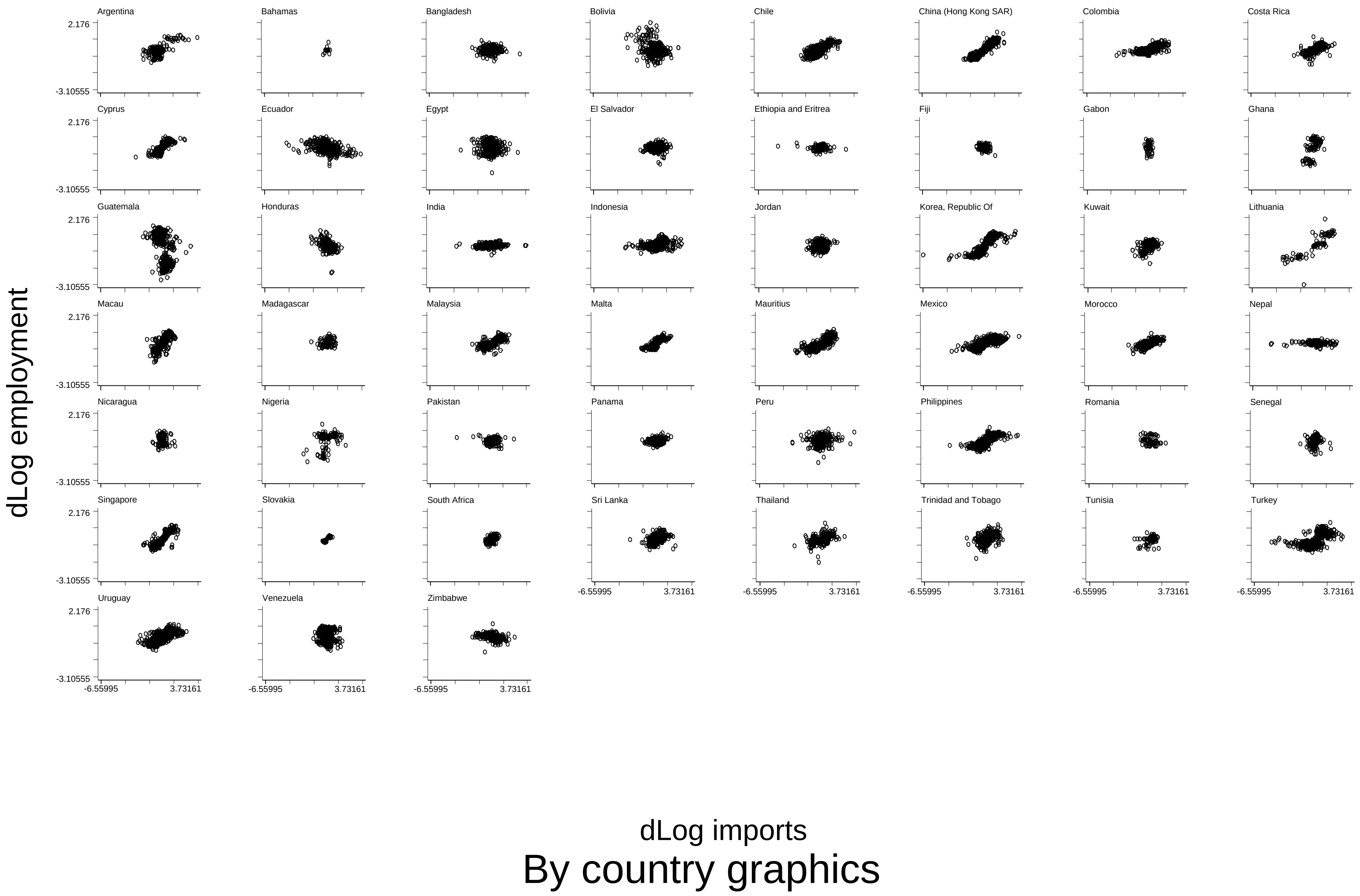

Figure 2: Industrial changes in employment related to imports in **Developing** countries

of imports could not be as negative as expected at the industry level, notwithstanding general equilibrium compensatory effects.

3 The theoretical framework

Consider a representative firm n located in a country i and selling in different markets j, $\forall j \in [1 \ldots J]$. It may exports to its own market ($j = i$) or to a foreign one ($j = j'$, $\forall j' \neq i$). The markets are assumed to be internationally segmented (see Brander (1981) or Brander-Krugman (1983)) and the goods sold on each of them are homogenous[8]. Assuming p_j the equilibrium price, $c_{ij,n}$ the marginal cost of the firm supported when exporting on j, the firm n chooses the quantities $x_{ij,n}$ to export that maximize its profits:

$$\prod_{i,n} = \sum_j \left[p_j x_{ij,n} - c_{ij,n} x_{ij,n}\right] \tag{1}$$

Without loss of generality, we assume that all firms in the same country have the same marginal cost to exports, with $c_{ij,n} = c_{ij}$, $\forall n$. Let σ_j represent the price elasticity of demand and $X_{.j}$ total demand addressed to all sellers in j. Hence, the first order condition leads to the following equation:

$$x_{ij,n} = x_{ij} = X_{.j}\sigma_j \frac{p_j - c_{ij}}{p_j} \tag{2}$$

Summing up over all the $N_{.j}$ sellers in j, we obtain from equation 2 the price expression:

$$p_j = \sigma_j \frac{\sum_i N_{ij} c_{ij}}{\sigma_j N_{.j} - 1} \tag{3}$$

Let

$$\overline{c_{.j}} = \sum_i \frac{N_{ij}}{N_{.j}} c_{ij} \tag{4}$$

be the weighted average of marginal costs to exports on the j market where N_{ij} represents the number of firms from i selling to j. Moreover, let $\mu_j = \frac{\sigma_j N_{.j}}{\sigma_j N_{.j} - 1}$ represents the average mark up rate over all the sellers in the market. The price equilibrium can now be expressed:

$$p_j = \mu_j \overline{c_{.j}} \tag{5}$$

Replacing this expression in equation 2 and summing over all the i exporting firms to j gives the bilateral trade equation:

$$X_{ij} = X_{.j} N_{ij} \sigma_j \left[1 - \frac{c_{ij}}{\mu \overline{c_{.j}}}\right] \tag{6}$$

As the marginal cost c_{ij} of a firm should be inferior or equal to the price this gives a ratio $\frac{c_{ij}}{\mu_j \overline{c_{.j}}} \leq 1$. This property enables us to apply the Taylor's expanding series, where $log(1 - \frac{c_{ij}}{\mu \overline{c_{.j}}}) \approx -\frac{c_{ij}}{\mu c_{.j}}$. Hence, log-linearizing expression 6 gives the following equation :

[8] For ease of exposition, we consider here the homogenous good assumption. However, the equations to be tested are still robust to the introduction of differentiation *à la* Gerosky (1983) or Martin (1993). The algebra can be provided upon request.

$$logX_{ij} = logX_{.j} + logN_{ij} - \frac{1}{\mu_j}\left[\frac{c_{ij}}{\overline{c_{.j}}}\right] + log\sigma_j \tag{7}$$

Relation 7, emphasizes the determinants of bilateral trade where $X_{.j}$ and N_{ij} components represent respectively a demand and supply effects,[9] whereas relative costs ($\frac{c_{ij}}{\overline{c_{.j}}}$) should capture a substitution effect $\left(-\frac{1}{\mu_j}\right)$. Notice that the degree of substitution depends on that of average mark ups, μ_j. In fact, in presence of competitive market structure (i.e small mark ups) resulting for instance from a high sensitivity to prices or aggressive behavior of suppliers, consumers tend to substitute goods more easily. [10]

The demand function in this framework is implicit and its sole representative is the price elasticity of demand σ. In fact, this function can take the form:

$$X_{.j} = A_j p_j^{-\sigma_j} = A_j \mu_j^{-\sigma_j} \overline{c_{.j}}^{-\sigma_j} \tag{8}$$

with A_j an externality like brand image or quality, affecting total demand for a given price. Replacing 8 in the structural equation 6, we obtain a reduced form trade equation:

$$logX_{ij} = -\sigma_j log\overline{c_{.j}} + logN_{ij} - \frac{1}{\mu_j}\left[\frac{c_{ij}}{\overline{c_{.j}}}\right] + log\frac{\sigma_j}{1+\alpha_j} + logA_j - \sigma_j log\mu_j \tag{9}$$

- First, assume that the *export* country is different from the *host* market ($i \neq j$, $\forall$ country i, and market j). Suppose moreover, that the marginal cost to export can be written as $c_{ij} = c_i\pi_{ij}$ where π_{ij} is superior to unity and represents any barrier to trade (tariffs, distance, etc ...). A reduction in the barriers to trade in the host market reduces relative costs of exporters (i.e., $\frac{\delta\left[\frac{c_{ij}}{\overline{c_{.j}}}\right]}{\delta\pi_{ij}} = \frac{\left[\frac{c_i\pi_{ij}}{\overline{c_{.j}}}\right]}{\delta\pi_{ij}} > 0$)[11], thus enhancing their bilateral exports X_{ij}, $\forall i \neq j$. Given a fixed total demand, this is a typical substitution effect.

However demand is not fixed. Recalling equation 4, it is straightforward that a reduction in the trade costs c_{ij} affects $\overline{c_{.j}}$ (i.e., $\frac{\delta\overline{c_{.j}}}{\delta c_{ij}}\frac{\delta c_{ij}}{\delta\pi_{ij}} > 0$) although in a smaller proportion. Total demand should increase, which amplifies the positive effect of a reduction in the barriers to trade on exports: this corresponding effect is that of demand.

- Next, assume now we are observing firms from one country selling to their own market (i.e. $i = j$). Then, the reduced form trade equation 9 becomes:

$$logX_{ii} = -\sigma_i log\overline{c_{.i}} + logN_{ii} - \frac{1}{\mu_i}\left[\frac{c_{ii}}{\overline{c_{.i}}}\right] + log\frac{\sigma_i}{1+\alpha_i} + logA_i - \sigma_i log\mu_i \tag{10}$$

[9] N_{ij} may represent a competition effect as well, given a demand level $X_{.j}$.

[10] It is to be noted that this relation is similar to the form of a gravity equation. The $logN_{ij}$ and $logX_{.j}$ variables express respectively the supply capacity of country i in market j and the market size of country j whereas geographical distance is captured by the deviation of the marginal costs to exports c_{ij} from the average $\overline{c_{.j}}$.

[11] To see this, $\frac{\delta\left[\frac{c_{ij}}{\overline{c_{.j}}}\right]}{\delta\pi_{ij}} = \frac{c'_{ij}c_{.j} - c'_{.j}c_{ij}}{c_{.j}^2} = \frac{c_i c_{.j} - \frac{N_{ij}}{N_{.j}}c_i c_{ij}}{c_{.j}^2} = \frac{c_i[c_{.j} - \frac{N_{ij}}{N_{.j}}c_{ij}]}{c_{.j}^2}$. Recalling $c_{.j} > \frac{N_{ij}}{N_{.j}}c_{ij}$ from equation 4 then $\frac{\delta\left[\frac{c_{ij}}{\overline{c_{.j}}}\right]}{\delta\pi_{ij}} > 0$.

How does foreign entry consecutive to openness of the *home* market impact sales of national ones? A reduction in the barriers to trade in the *home* market leads to a reduction in the costs of foreign goods that enter it, reducing in consequence average costs $\overline{c_{.i}}$. This directly and negatively affects domestic firms' sales through the term $\left[\frac{c_{ii}}{\overline{c_{.i}}}\right]$ (substitution effect), but produces at the same pace a downward pressure on prices. Consequently, total demand increases and leads in return to an indirect positive effect on domestic sales (*via* $log\overline{c_{.i}}$). This could explain why adjustments to imports might not be very strong as suggested by the facts highlighted in the prior section. Table 1 summarizes the theoretical effects from a liberalization in the home and foreign markets.

Table 1: The effects of liberalisation of the home and foreign markets on sales of country i

	Δ(sales) of country i	
	Substitution effect	**Demand effect**
Liberalisation of own market i	-	+
Liberalisation of foreign market j	+	+

Notice from equation 10 moreover, that both the substitution and demand effects are stronger the strongest is the sensitivity to prices σ. In fact, when the price elasticity of demand is high, mark ups should be low and thus the substitution effect ($\frac{1}{\mu_i}$) would be high. In addition, a high value of σ leads to a high demand effect ($-\sigma_i$). Again, this framework appears to be consistent with the observations on selected homogenous good products in the latter section.

However, for estimation purposes we shall refer in the following sections to the structural equations like in 7 where total demand is apparent instead of reduced form equations like 9 and 10[12].

4 The Labor Demand Equation

How can we relate these bilateral trade equations to labor demand? Assuming a Cobb Douglas function, and recalling that total production is the sum of bilateral exports on all of the markets, domestic and foreign ones ($Y_i = \sum_j X_{ij}$), the conditional labor demand equation can be represented by[13]:

$$L_i = (\sum_j X_{ij})^{\beta} T_i^{\theta} K_i^{\upsilon} \tag{11}$$

[12]In fact, we can construct easily a vector of total demand from our data whereas we do not have access to any demand shifters to represent A_j like quality or brand image variables for the whole panel of countries we work on in order to test the reduced form equation. In addition, the costs data that we use (*Cf.* infra) are imperfect proxies which can produce high correlation between $log\overline{c_{.j}}$ and $\frac{c_{ij}}{\overline{c_{.j}}}$. This might produce inconsistent estimates if we base our empirical study on the latter equation.

[13]Note that the oligopoly model presented so far assumes constant marginal costs which presumes constant returns to scale of production factors. On the other hand, we know from some empirical literature that quantities are produced with increasing returns of labour. This is why, in what follows, we prefer estimating the degree of returns to scale in employment (β, hereafter) instead of constraining it to 1. One can show however that even with variable marginal costs ($\beta \neq 1$), the 'double' effect of substitution and demand is still obtainable.

Although we shall assume that capital (K) and technical progress (T) are given in the short run[14], we show in what follows that our specification has the particular advantage to link instead domestic employment to foreign market structures. In particular, as it is shown hereafter, our relation shall be informing us about the substituability between domestic and foreign labour services embodied in the trade quantities. Let $dlogL_i = \frac{dL_i}{L_i}$ be the growth rate of labour demand, and $\forall j \in [1 \dots J]$, $dlogX_{ij} = \frac{dX_{ij}}{X_{ij}}$ that of bilateral trade. Transforming equation 11, and defining e_{ij} the intensity to exports on each market j we have:

$$dlogL_i = \beta \left[dlogX_{ii} \; e_{ii} \right] + \beta \sum_{j' \neq i} \left[dlogX_{ij} \; e_{ij} \right] \tag{12}$$

The growth rate of industry labour demand is expressed then as linear combination of bilateral trade growths weighted by the intensity to exports e_{ij}, $\forall j \in 1 \dots J$.

We assume hereafter that every firm sells to each market j, $\forall j$. Hence, accounting for $N_{ii} = N_{ij}$ and replacing the bilateral trade expression 6, for each market j, in equation 12 we obtain the following *general* specification for labour demand:

$$dlogL_i = \beta \left[dlogX_{.i} \; e_{ii} \right] - \frac{\beta}{\mu_i} d\left(\frac{c_{ii}}{\overline{c}_{.i}} \right) \; e_{ii} + \beta \sum_{j' \neq i} \left[dlogX_{.j} \; e_{ij} \right] - \sum_{j'} \frac{\beta}{\mu_j} d\left(\frac{c_{ij}}{\overline{c}_{.j}} \right) \; e_{ij} + \beta dlogN_{ii} \tag{13}$$

In this equation, employment growth depends on that of domestic demand and each foreign markets' demand. Moreover, employment growth is negatively related to relative costs variations in each market country i is export to. Recall that this is a structural equation. Total demand in each market depends on costs in return (see equation 8). Hence, the two effects of demand and substitution in each of the markets affect labour demand j, $\forall j \in [1 \dots J]$. These effects are the more significant the larger the intensity to export to these markets, e_{ij}, $\forall j$ [15].

In case the country i has a strong export intensity to a market j', $\forall j' \neq i$ in some industry (high $e_{ij'}$), a change in costs or demand related to that market affects significantly the employment in the exporting country. On the opposite, if most of that country's production is sold on the domestic market (small $e_{ij'}$), a shock on foreign market structure (via a variation in costs or demand) would not affect much employment in i.

Although it has some nice properties, the above equation of employment does not introduce directly the vector of imports. In fact, high relative costs increase imports and thus reduce employment. But imports affect prices and total demand which, in return, should resorb at least a part of this potential reduction in employment. So both vectors of costs and demand capture some information on the impact of imports. The next sections try to elicit this hidden information. We show then how we can modify slightly the above equation in order to introduce the vector of imports and emphasize how it could capture a pure substitution or demand effect.

[14]This could be a strong assumption. However, we did not have access to capital stocks neither to technical progress proxies like TFP for most of the considered countries. We could have found these observations for some OECD countries from other data sources, but we would have lost then all the information regarding developing countries.

[15]This same reasoning prevails for the domestic market i, where these effects are strong when intensity to trade with self, e_{ii}, is high.

4.1 Imports revealing substitution

The average cost equation 4 can be re-expressed as:

$$\overline{c_{.i}} = \frac{N_{ii}}{N_{.i}} c_{ii} + \frac{\sum_j' N_{j'i}}{N_{.i}} c_{j'i}$$

with N_{ji} et c_{ji} representing respectively the number and marginal cost of firms from country j exporting to i. Dividing by $\overline{c_{.i}}$ and differentiating we obtain:

$$\frac{N_{ii}}{N_{.i}} \left(d\frac{c_{ii}}{\overline{c_{.i}}} \right) = -\frac{\sum_j' N_{j'i}}{N_{.i}} \left(d\frac{c_{j'i}}{\overline{c_{.i}}} \right) \tag{14}$$

Besides, we can obtain an expression for bilateral imports of i, X_{ji}, from equation 6. When summing X_{ji} over all the j countries, we can thus deduce an expression for total imports of country i. Transforming into log differential and replacing $\frac{N_{ji}}{N_{.i}} d \left[\frac{c_{ji}}{\overline{c_{.i}}} \right]$ by its corresponding expression in equation 14 we obtain:

$$dlogM_i = dlogX_{.i} + dlogN_{.i} + \frac{1}{\mu_j} \frac{N_{ii}}{N_{.i}} \left(d\frac{c_{ii}}{\overline{c_{.i}}} \right) \tag{15}$$

Substituting into the equation of intra-national trade $dlogX_{ii}$ gives:

$$dlogX_{ii} = \left(1 + \frac{N.i}{N_{ii}} \right) dlogX_{.i} + dlogN_{ii} + \frac{N.i}{N_{ii}} dlogN_{.i} - \frac{N_{.i}}{N_{ii}} dlogM_i \tag{16}$$

In this alternative specification, equation 16 explicit the negative effect of imports on domestic producer's sales X_{ii}, in growth terms. The basic idea is as follows: a growth in relative costs of domestic producers should increase imports (see equation 15)) via a substitution effect. At equal market size (i.e: $dlogX_{.i}$ given), the sales of domestic producers shrink (equation 16). Replacing that expression into the labour demand expression and noting $\rho = \frac{N.i}{N_{ii}}\beta$, we have:

$$\begin{aligned} dlogL_i \quad = \quad & (\beta + \rho) \left[dlogX_{.i}\ e_{ii} \right] - \rho \left[dlogM_i\ e_{ii} \right] + \beta \sum_{j' \neq i} \left[dlogX_{.j'}\ e_{ij'} \right] \\ & - \sum_{j'} \frac{\beta}{\mu_j'} d \left(\frac{c_{ij'}}{\overline{c_{.j'}}} \right)\ e_{ij'} + \beta dlogN_{ii} + \beta \frac{N.i}{N_{ii}} dlogN_{.i} e_{ii} \end{aligned} \tag{17}$$

This alternative equation of labour demand enables to estimate the pure substitution effect of imports while controlling for the demand effect. From this equation we expect that the parameter estimate on imports to be smaller than that on demand (i.e: $\rho < \beta + \rho$.). More rigorously, in case a few numbers of foreign firms compared to domestic one are serving the market, we have $N_{.i} \approx N_{ii}$, and thus the parameter on the demand variable will tend to 2β and should be twice as big as that on imports $\rho = \beta$. However, when the economy is not specialized in a typical industry leaving most of the market to be served by a high number of foreign firms, then we expect that the two parameters on demand and imports to be relatively similar $(\beta + \rho) \approx \rho$.

4.2 Imports revealing demand

The total demand on market i, $X_{.i}$, is the sum of national demand for domestic goods X_{ii}, and that of imported goods M_i with $M_i = \sum_{j'} X_{j'i}$, $\forall j' \neq i$. The growth of total demand can be written as:

$$\frac{dX_{.i}}{X_{.i}} = dlogX_{.i} = dlogX_{ii}\; S_{ii} + dlogM_i\; (1 - S_{ii}) \tag{18}$$

with S_{ii} and $1 - S_{ii}$ representing respectively the market shares of domestic and foreign sellers on the i market[16].

Replacing equation 18 into the intra-national trade equation X_{ii}[17] and expressing it in growth terms, we have:

$$dlogX_{ii} = dlogM_i + dlogN_{ii}\left(\frac{1}{1 - S_{ii}}\right) - \frac{1}{\mu_i}\left(\frac{1}{1 - S_{ii}}\right)\left[\frac{c_{ii}}{\overline{c_{.i}}}\right] \tag{19}$$

Here, the growth rate of domestic producers' sales on their market is proportional to that of total imports $dlogM_i$. Hence, when the substitution effect is taken into account by other variables in the equation, the vector of imports reveal a pure demand effect.

This alternative expression of the intra-national trade equation can be replaced in the equation of labour demand to give the second equation to estimate:

$$dlogL_i \;=\; \beta\left[dlogM_i\; e_{ii}\right] - \frac{\beta}{\mu_i}\left(\frac{1}{1 - S_{ii}}\right) d\left(\frac{c_{ii}}{\overline{c_{.i}}}\right)\; e_{ii} \tag{20}$$

$$+\beta \sum_{j' \neq i}\left[dlogX_{.j}\; e_{ij'}\right] - \sum_{j'} \frac{\beta}{\mu_j} d\left(\frac{c_{ij}}{\overline{c_{.j}}}\right)\; e_{ij'} + \beta' dlogN_{ii} \tag{21}$$

with $\beta' = \beta\left[\frac{e_{ii}}{1 - S_{ii}} + \sum_j' e_{ij'}\right] > \beta$. Notice that that the size of the positif effect of imports, represented by $dlogM_i$, should be comparable to that of total demand X_i in equation 13.

5 The dataset

We collect our industry data at the 3 digit ISIC nomenclature from two UNIDO databases. The first set is from the Industrial Statistics Database (Indstat3) and reports data on activity such as 3-digit industry total compensation (wages and benefits), employment, production and number of firms (ISIC rev.2). The second set is from the Industrial Demand-Supply database (IDSB) and provides trade variables based on UNIDO tapes. For each observed country, import and export values are reported at the 4-digit industry level (ISIC rev.2 as well), and are easily aggregated to 3-digit[18]. The trade database does not provide information on bilateral basis. For each given country, it reports total trade (imports and exports) conducted with the developing countries on the one hand and that observed with the developed countries on the other hand. Hence, in what follows we shall consider that each observed country

[16] $1 - S_{ii}$ may be interpreted moreover as the penetration rate of imports.

[17] see equation 6 when $i = j$.

[18] See appendix for more details

is selling to three distinguished markets: 1) its own market (intra national trade), 2) the industrialized countries' market (noted Ind hereafter), and 3) the developing countries' market (Dev hereafter). After matching the activity and trade datasets, we were able to construct a table of activity and trade data for 65 developed and developing countries in 29 industries, each selling to these three markets between 1981-1997.

We have two relations to estimate. In equation 21, the variable of imports enters explicitly the relation to be tested in order to capture a positive demand effect while equation 17 introduces imports to control for a negative substitution effect.

Before testing these equations, we define hereafter the used variables.

5.1 The relative costs proxy

Equations 21 enclose relative costs variables $d\left(\frac{c_{ij}}{\overline{c_{.j}}}\right)$ with respect to each export market j, $\forall j \in [i, Ind, Dev]$. We do not observe marginal costs to exports c_{ij}, $\forall j$. *A fortiori*, we cannot infer a measure of the weighted average of marginal costs $\overline{c_{.j}}$. Due to a limited access of internationally comparable data on costs, we consider a simple form of the marginal costs to exports $c_{ij} = \pi_{ij} w_i$, with π_{ij} a transaction costs to trade parameter in market j that is superior to 1. w_i represents the wage per employee in the exporting country i. Moreover, referring to equation 4 the weighted average of marginal costs can be proxied by:

$$\widetilde{c_{.j}} = \sum_i \frac{X_{ij}}{X_{.j}} w_i$$

In the theoretical equation 4, the relative number of firms represent the weights for each country's marginal cost. Here instead, we replace the number of firms by relative exports as we know that they capture indirectly specific transaction costs (π_{ij}) as well.

The relative costs differential that enters the equations to estimate can then be proxied by :

$$d\left(\frac{c_{ij}}{\overline{c_{.j}}}\right) = \pi_{ij} d\left(\frac{w_i}{\sum_i \frac{X_{ij}}{X_{.j}} w_i}\right) = \pi_{ij} d\left(\frac{w_i}{\widetilde{w_j}}\right) \quad \forall j \in [i, Ind, Dev] \tag{22}$$

On the domestic market, π_{ii} should be relatively small (around unity) because the barriers to intra-national trade should not be too significant. However, $\forall j' \neq i$, the value of $\pi_{ij'}$ may be significantly superior to 1. In particular, formal and informal costs from trading between rich and developing countries are expected to be high.

The wage per employee variable could not be a very good proxy of production costs, especially when it can hide productivity effects or mechanisms related to the imperfection of the labour markets. As a matter of fact, high average wages in one industry could reveal a good performance of that industry in productivity which is usually correlated with wages. Moreover, a high remuneration can be the consequence of some rent sharing policy, due to a good performance of the industry. Hence, the estimated negative cost effect on the wage per employee variable could be biased downward. However, we partly avoid this potential problem when estimating equation 17, where the substitution effect is no longer captured by the w_i variable on the domestic market but is controlled for by the vector of imports that enters the regression.

Note finally, that although the wage type variable might affect trade via its direct impact on production costs, it is not a good variable to predict the substitution effect that result from changes in pure trade costs (tariffs, transport, ...). Unfortunately, we could not have access to these variables for the whole sample we had at the industry level. However, in the equation where imports should reveal substitution, the vector of imports replaces the vector of costs that enter otherwise the equation. To that respect, imports are not only playing the role of production costs but retain information on all other transaction costs generated by trade (Tariffs, freight, etc...).

5.2 The demand variables

The total demand (or apparent consumption) in the market i, and both foreign markets Ind and Dev demand variables were computed from production, imports and exports variables provided by UNIDO. Hence, $\forall j \in [i, IndDev]$ the demand in the j market is given by $(PIB_j - (Exp_{Ind} + Exp_{Dev}) + (Imp_{Ind} + Imp_{Dev}))$.

5.3 The number of firms

ONUDI database provides the number of firms in each industry for a given country. However, some proportion does not export to foreign markets while our theoretical model is based on the assumption that all the firms are exporting. Our framework is still consistent with the possible fact that part of these firms are not exporting: actually, the same equations to estimate can be retrieved although one additional variable should now enter our formulation. It concerns the growth of the proportion of export firms $dlog\frac{N_{ij}}{NT_i}$, where N_{ij} would express only now the exporting firms from i to j and NT_i is the total number of firms in an industry of a country i. As we do not observe this variable, we consider that it does not evolve much during the period following Roberts and Tybout (1997) findings. This enables us to exclude it from the equation to test[19].

6 Matching theory with data

We break up the panel into two groups, OECD and developing countries, and run industry type regressions. We choose to represent the theoretical variables in differentials, in terms of first differences when computing variables for econometrics. This type of regression has the well-known advantage to take the country fixed effects implicitly into account. We have controlled for heteroscedasticity problems by White's method. We have conducted other estimation methods like GMM but found similar results. In order to save space, and because the DWH tests we ran suggested that IV type regressions were not necessary, the GMM results will not be reported here[20].

[19] Roberts and Tybout gather exhaustive Columbian data on firms above 10 employees and find that the proportion of exporters was relatively stable over the 80s (around 12 per cent). We must add that Bernard et Jensen (1996) and Aitken *et al* (1997) find a significant growth of relative exporters on US and Mexican data. However, theses authors work on surveys gathering a sample of firms that are over-represented by big size units, and thus are likely to export more than small businesses.

[20] GMM results can be provided upon request. The instruments used were the lagged variables of explanatory variables in the equations, added to lagged industrial production, import and export vectors.

We test two specifications that discriminate between the demand and the substitution effects. We adjust the theoretical relations to account for the three markets $\{i, Ind, Dev\}$ we observe.

Moreover, theory implies some direct links between the parameters referred to in section 4. For example, theory pretends that the coefficients on the demand variables regarding the two foreign markets and the imports' demand effect should be equal ($\beta_{dem} = \beta_{Ind} = \beta_{Dev} = \beta$) while β should be inferior to that on the number of firms ($\beta'_{N_{ii}}$) in the 'Import Revealing demand' equation. We prefer not to constrain that link between parameters however, as we need to test whether *ex-post* estimates are consistent with the theory. In a way, we are trying to test the validity of the adopted theory. Unconstraining the values of the parameters could subsequently inform us on the quality of the data as well. We want to see whether the magnitude of the parameters matches that of theory and other empirical findings in the literature.

-Substitution effect

Adapting equation 17 to the data gives the first equation to estimate, where imports reveal a substitution effect:

$$\begin{aligned} dlogL_i &= (\beta+\rho)_{Dom}\,[dlogX_{.,i}\;e_{ii}] - \rho_{sub}\,[dlogM_i\;e_{ii}] + \\ &\quad \beta_{Ind}\,[dlogX_{.,Ind}\;e_{i,Ind}] - \eta_{Ind} d\left(\frac{w_{ii}}{w_{Ind}}\right)\;e_{i,Ind} + \\ &\quad \beta_{Dev}\,[dlogX_{.,Dev}\;e_{i,Dev}] - \eta_{Dev} d\left(\frac{w_{ii}}{w_{Dev}}\right)\;e_{i,Dev} + \beta_{N_{ii}} dlogN_{ii} + \beta_{N_{.i}} dlogN_{.i}e_{ii} \end{aligned} \tag{23}$$

This specification implies that the coefficient on domestic demand should be equal to $(\beta+\rho)_{Dom}$ whereas that of imports should be negative and equals ρ_{sub}. The parameter on the domestic demand variable is a linear function of that on imports. Recalling $\rho = \frac{N_{.i}}{N_i i}\beta$ from theory, if foreign firms form a small proportion of domestic ones on a market we have $N_{.i} \approx N_{ii}$ and thus $\beta + \rho \approx 2\rho$. These two parameters tend to be similar, in absolute values however, in the opposite case. Notice moreover that following the theoretical relation 17, the total number of firms variable $dlogN_{.i}$, enters now the equation.

- Demand effect

Constrained by the data we are provided with, equation 21 that highlights imports as capturing a demand effect is the second relation to estimate:

$$\begin{aligned} dlogL_i &= +\beta_{dem}\,[dlogM_i\;e_{ii}] - \eta_{Dom} d\left(\frac{w_{ii}}{w_i}\right)\;\frac{e_{ii}}{1-S_{ii}} + \\ &\quad \beta_{Ind}\,[dlogX_{.,Ind}\;e_{i,Ind}] - \eta_{Ind} d\left(\frac{w_{ii}}{w_{Ind}}\right)\;e_{i,Ind} + \\ &\quad \beta_{Dev}\,[dlogX_{.,Dev}\;e_{i,Dev}] - \eta_{Dev} d\left(\frac{w_{ii}}{w_{Dev}}\right)\;e_{i,Dev} + \beta'_{N_{ii}} dlogN_{ii} \end{aligned} \tag{24}$$

The effect of imports is now expected to be positive $\beta_{dem} > 0$. The β_j parameters relative to each foreign market along with the coefficient on imports β_{dem} measure actually the returns to scale in employment indicator β. This parameter can also be interpreted as a shifter from the market structure adjustment to the employment adjustment to trade. In the case of increasing returns to employment $0 < \beta_1 < 1$, the adjustment on employment is weaker[21]. Oulmane (1999) studies the role of economies to scale at openness and finds this result by applying his framework to French employment data.

The relative cost effect (or substitution effect of costs) represented by η_j, ($\eta_j = \beta \frac{\pi_j}{\mu_{ij}}$), $\forall j \in [i, Ind, Dev]$, is associated with a negative sign and its magnitude depends on the state of competition interacted with the degree of employment returns to scale. In fact, an increase in domestic costs reduces domestic production *via* $\frac{\pi_j}{\mu_{ij}}$ before being transmitted to labour demand through β. The $\frac{\pi_j}{\mu_{ij}}$ parameter, can be viewed as an indicator of the state of competition. Its high value reveals a small mark up μ_{ij}, the latter depending on the price elasticity, number of firms and their reciprocal aggressive behavior. Moreover, in an industry where competition is tough, the barriers to trade captured by π_{ij} are more likely to favor domestic producers at the expense of foreign ones. As a result, the effect of the degree of competition interacts with that of employment returns to scale to determine the pure substitution effect on employment. To sum up, in the case of high competition and decreasing returns industry, the substitution impact should be relatively high.

Recall as well from equation 21 that the parameter β' on the number of firms should be greater than that on imports β.

We recapitulate the two specifications that we test in table 2.

7 Econometric results

7.1 Imports as substituts

Table 3 reports the results for the specification of 'Imports revealing substitution' for the OECD countries (equation 23). The impact of imports is shown to be negative and statistically significant for over 17 out of 29 industries while the effect is not significant for most of the remaining sectors. Only in 2 industries however (Industrial chemicals and Wearing Apparel), the coefficient on imports is significantly positive.

Moreover, as expected the sign and significance of the domestic demand parameter ($\beta_{dom} + \rho_{dom}$) is found to be positive for a very large proportion of the industries. Besides, the coefficients corresponding to the demand variable are twice as bigger (in absolute values) than that of imports for 11 industries (when accounting for standard errors). This is consistent with our theory when there are relatively few foreign firms serving the market[22].

In addition, the coefficients relative to imports are comparable to those on $dlogN_i$, the number of domestic firms' variable, in 13 industries.

Hence, most of the above results are consistent with our theoretical framework and in particular, with the fact that imports are carrying a substitution effect when the demand effect is properly accounted for in the specification. One should note moreover, that the substitution effect measured here is usually higher for homogeneous good industries than for

[21]Notice that this indicator informs on the returns to scale from the sole labour factor. It does not give an indication on the degree of economies of scale, that depends on *all* of the factors used in production.

[22]Notice however that although in small number, the market share of these foreign firms could be relatively high in an oligopolistic market. This is to show that such a result remains perfectly consistent with a high degree of openness of the corresponding industries to foreign products

Table 2: Alternative Econometric Specifications

	1: Imports revealing substitution(eq. 23)	2: Imports revealing demand (eq. 24))
$d(logX_{.,i})e_{ii}$	$(\beta+\rho)_{dom}$	
$d\widetilde{\frac{w_{ii}}{w_{.i}}}\frac{e_{ii}}{1-S_{ii}}$		$-\eta_{dom}$
$dlogM_i e_{ii}$	$-\rho_{sub}$	$+\beta_{dem}$
$d(logX_{.,Ind})e_{i,Ind}$	β_{Ind}	β_{Ind}
$d\widetilde{\frac{w_{i,Ind}}{w_{.,Ind}}}e_{i,Ind}$	$-\eta_{Ind}$	$-\eta_{Ind}$
$d(logX_{.,Dev})e_{i,Dev}$	β_{Dev}	β_{Dev}
$d\widetilde{\frac{w_{i,Dev}}{w_{.,Dev}}}e_{i,Dev}$	$-\eta_{Dev}$	$-\eta_{Dev}$
$dlogN_{ii}$		$\beta'_{N_{ii}}$
$dlogN_{.i}$	$\beta_{N_{.i}}$	
Note: $-\eta_j = -\beta_j \frac{\pi_j}{\mu_j}, \forall j \in [i, Ind, Dev]$ $-\rho_{sub} = -\left[\beta \frac{N_{.i}}{N_{ii}}\right]_{sub}$		
Theory conjectures that: Specification 1/ $\beta_{Ind} = \beta_{Dev} = \beta_{N_{.i}}$ and $\rho_{sub} \leq (\beta+\rho)_{dom} \leq 2\rho$ Specification 2/ $\beta_{dem} = \beta_{Ind} = \beta_{Dev} = \beta$ and $\beta < \beta'_{N_{ii}}$		

differentiated good ones. This general result is consistent with the intuition that in presence of homogenous goods, the substitution is of a larger magnitude [23]. But more interestingly, this large substitution effect for homogenous good industries is balanced by a high demand effect (coefficient on domestic demand variable) for the same type of industries as it is shown in Footwear, Glass and Products, Pottery and China and Wood products. Actually, while it is shown to be above 1 for these industries, the demand effect rarely reaches 0.4 for some known differentiated good industries like Electrical and Machinery, Chemical Products, Professional and Scientific Products and Transport Equipment.

What are the effects of variables related to foreign markets on employment? Table 3 shows an effect of apparent consumption on *Ind* and *Dev* markets that is positive and significant for 12 and 7 industries respectively. Half of the industries do not benefit however from demand expansion in foreign markets (non significant parameters values). Besides, two (resp. 8) industries exhibit negative coefficients when selling to industrialized (resp. developing) markets. In these particular sectors, and as long as foreign markets are concerned our theory does not seem to be consistent with the data.

However, an increase in relative wages affect by substitution domestic employment for 10 (resp. 13) sectors when selling to the foreign markets *Dev* (resp. *Ind*) while it is unsignificant for a great majority of the remaining industries. In addition, when selling to the OECD market, the cost effect appears to be higher in industries known to produce homogenous products rather than differentiated products ones (See for instance the Rauch's or Oliveira Martins' classification to distinguish between homogenous and differentiated goods' industries.).

The specification produces qualitatively the same results for the developing countries' panel (see table 4 for more details). In particular, the same negative and significant effect is usually observed on imports on 15 industries, in 9 of which the effect of the imports is twice as lower than that of domestic consumption. These findings are consistent with our theory.

7.2 The demand effect of imports

Table 5 presents the results of the specification of 'Imports revealing demand' (equation 24) for the panel of industrialized countries. Here, we can see that imports are carrying a positive and significant effect instead that appears for more than half of the industries. Moreover, as discussed earlier, theory predicts that this impact is smaller than that of the number of firms which is in line with most of our results. These two findings are completely consistent with our theoretical framework.

The parameter values on imports for the remaining industries, do not enjoy the same outcome however as they appear to be very low, or even negative in the case of 6 sectors. One of the reasons is due to the error of measurement of the cost proxy on the domestic market, that does not control for some costs variations which in return, could be captured by the vector of imports. Consequently, the demand effect expected on imports in this specification might be altered by a substitution one, thus biasing downward the corresponding parameter.

However, the cost variable relative to the domestic market appears with the right expected sign for only 4 industries while the effect is insignificant or positive in the remaining cases.

[23]This result joins that of Erkel Rousse and Mirza (2002) who found that the price elasticity corresponding to the elasticity of substitution is higher in homogenous than differentiated good industries.

Table 3: Imports capturing a **Substitution effect** in the **OECD countries**

Industry	Imports	Dom Conso	R. cost *Ind*	Conso *Ind*	R. cost *Dev*	conso *Dev*	Estb.	Total Estb.	R2	N.Obs.
	$dlogM_i e_{ii}$	$dlogX_{.,i} e_{ii}$	$d(w_{ii}/\overline{w_{Ind}}) e_{i,Ind}$	$dlogX_{.,Ind} e_{i,Ind}$	$d(w_{ii}/\overline{w_{Dev}}) e_{i,Dev}$	$dlogX_{.,Dev} e_{i,Dev}$	$dlogN_{ii}$	$dlogN_{.i}$		
	$-\rho_{Dom}$	$\beta_{Dom}+\rho_{dom}$	$-\eta_{Ind}$	β_{Ind}	$-\eta_{Dev}$	β_{Dev}	$\beta_{N,i}$	$\beta_{N,i}$		
Beverages	**-0,09** ***	**0,32** ***	**-1,16** ***	**1,33** ***	**0,06**	**-1,13**	**0,20** ***	**0,13** **	**0,71**	**222**
	0,04	*0,05*	*0,35*	*0,25*	*0,47*	*1,45*	*0,04*	*0,06*		
Fab. metal products	**-0,25** ***	**0,44** ***	**0,66** **	**1,67** ***	**-2,01** ***	**-4,53** ***	**0,36** ***	**0,12** **	**0,93**	**208**
	0,05	*0,07*	*0,33*	*0,39*	*0,49*	*0,97*	*0,04*	*0,06*		
Food products	**-0,15** ***	**0,52** ***	**-0,35**	**0,31**	**-0,56**	**-0,32**	**0,36** ***	**0,32** ***	**0,95**	**208**
	0,06	*0,09*	*0,38*	*0,19*	*0,52*	*0,61*	*0,04*	*0,09*		
Footwear	**-0,55** ***	**1,02** ***	**-0,23** ***	**0,31** **	**-0,28**	**1,07**	**0,58** ***	**0,57** ***	**0,70**	**219**
	0,15	*0,17*	*0,09*	*0,15*	*0,63*	*0,98*	*0,05*	*0,13*		
Furniture	**-0,31** ***	**0,67** ***	**-0,01**	**0,07**	**-0,40**	**-1,40** *	**0,33** ***	**0,63** ***	**0,90**	**219**
	0,04	*0,07*	*0,14*	*0,14*	*0,39*	*0,78*	*0,03*	*0,07*		
Glass and products	**-0,41** ***	**1,08** ***	**-1,07** ***	**0,96** ***	**-0,81**	**-1,58**	**0,16** ***	**-0,73** ***	**0,71**	**231**
	0,08	*0,10*	*0,34*	*0,25*	*0,65*	*1,84*	*0,03*	*0,18*		
Industrial chemicals	**0,31** ***	**0,27** ***	**0,41** *	**0,30**	**-3,11** ***	**0,14**	**0,22** ***	**0,18** ***	**0,77**	**213**
	0,07	*0,06*	*0,21*	*0,20*	*0,44*	*0,65*	*0,03*	*0,05*		
Iron and steel	**-0,12** *	**0,35** ***	**0,14**	**0,03**	**-0,28**	**-1,15** *	**0,09** **	**-0,62** ***	**0,44**	**175**
	0,07	*0,09*	*0,12*	*0,10*	*0,23*	*0,69*	*0,04*	*0,09*		
Leather products	**0,04**	**0,14**	**-0,19** ***	**0,17** ***	**-0,09**	**1,70** ***	**0,28** ***	**0,47** ***	**0,89**	**233**
	0,07	*0,09*	*0,07*	*0,06*	*0,26*	*0,31*	*0,03*	*0,10*		
Machinery, electric	**-0,10** *	**0,32** ***	**-0,07**	**0,05**	**0,00**	**0,12**	**0,15** ***	**-0,02**	**0,31**	**192**
	0,06	*0,06*	*0,11*	*0,23*	*0,01*	*0,38*	*0,02*	*0,12*		
Machinery	**0,02**	**0,22** ***	**0,10**	**-0,12**	**-0,34** **	**-0,74** **	**0,12** ***	**-0,16**	**0,20**	**175**
	0,06	*0,07*	*0,08*	*0,15*	*0,16*	*0,30*	*0,04*	*0,15*		
Misc. petroleum	**0,04**	**0,16** ***	**0,35**	**-0,84** ***	**1,24** ***	**1,47**	**0,37** ***	**-0,43** **	**0,54**	**188**
	0,07	*0,06*	*0,30*	*0,27*	*0,47*	*1,03*	*0,06*	*0,19*		
Non-ferrous metals	**-0,06**	**0,42** ***	**-0,19**	**-0,02**	**0,38**	**-1,41** ***	**0,26** ***	**0,59** ***	**0,51**	**208**
	0,05	*0,07*	*0,18*	*0,08*	*0,50*	*0,34*	*0,06*	*0,15*		
Other chemicals	**-0,43** ***	**0,63** ***	**0,10**	**-0,11**	**-1,15** ***	**-0,88**	**0,16** ***	**0,02**	**0,43**	**218**
	0,07	*0,06*	*0,23*	*0,26*	*0,37*	*0,98*	*0,04*	*0,10*		
Other manuf. Prod.	**-0,10**	**0,13**	**-0,05**	**0,45** ***	**0,07**	**-1,76** *	**0,21** ***	**0,97** ***	**0,75**	**203**
	0,10	*0,10*	*0,08*	*0,16*	*0,16*	*0,98*	*0,04*	*0,08*		
Other non-metal. prod.	**-0,30** ***	**0,65** ***	**-1,21** ***	**-1,43** ***	**1,61** ***	**4,87** ***	**0,20** ***	**0,16** ***	**0,94**	**219**
	0,03	*0,05*	*0,33*	*0,43*	*0,42*	*0,73*	*0,03*	*0,04*		
Paper and products	**-0,31** ***	**0,52** ***	**-1,24** ***	**1,89** ***	**-0,04**	**1,53**	**0,07** *	**-0,15** **	**0,59**	**233**
	0,05	*0,07*	*0,25*	*0,26*	*0,68*	*1,35*	*0,04*	*0,07*		
Petroleum refineries	**-0,06** *	**0,12** ***	**-0,23** **	**0,11**	**-0,39**	**-0,74**	**0,07** ***	**0,08**	**0,21**	**190**
	0,04	*0,04*	*0,11*	*0,15*	*0,35*	*0,88*	*0,02*	*0,10*		
Plastic products	**-0,35** ***	**0,83** ***	**-0,49** **	**-0,31**	**1,25**	**-3,56** *	**0,02**	**0,64** ***	**0,85**	**234**
	0,06	*0,08*	*0,24*	*0,28*	*0,91*	*1,99*	*0,05*	*0,08*		
Pottery, china	**-0,79** ***	**1,41** ***	**-1,21** ***	**0,49** ***	**-0,88** **	**1,24** ***	**0,03**	**-0,24** **	**0,90**	**230**
	0,08	*0,09*	*0,23*	*0,09*	*0,41*	*0,47*	*0,03*	*0,12*		
Printing and publishing	**-0,10** ***	**0,29** ***	**-0,75** **	**-0,79**	**-2,51** ***	**3,94** ***	**0,13** ***	**-0,04**	**0,37**	**215**
	0,03	*0,04*	*0,33*	*0,50*	*0,72*	*0,96*	*0,02*	*0,06*		
Professional & scientific	**-0,07**	**0,09**	**-0,05**	**0,37** *	**-1,65** **	**0,73** **	**0,26** ***	**0,43** ***	**0,81**	**183**
	0,10	*0,09*	*0,30*	*0,21*	*0,64*	*0,35*	*0,06*	*0,11*		
Rubber products	**-0,46** ***	**0,63** ***	**-0,11**	**1,41** ***	**-1,59** ***	**3,05** ***	**0,48** ***	**1,37** ***	**0,91**	**232**
	0,09	*0,09*	*0,20*	*0,21*	*0,43*	*1,17*	*0,04*	*0,07*		
Textiles	**0,03**	**0,09**	**0,09**	**1,17** ***	**-0,72** ***	**0,02**	**0,40** ***	**0,50** ***	**0,96**	**242**
	0,04	*0,06*	*0,14*	*0,17*	*0,25*	*0,79*	*0,03*	*0,07*		
Tobacco	**0,01**	**0,05**	**-0,42**	**0,07**	**-0,54**	**-0,25**	**0,12** ***	**-0,01**	**0,18**	**218**
	0,02	*0,03*	*0,34*	*0,29*	*0,34*	*1,18*	*0,03*	*0,02*		
Total manufacturing	**0,04**	**0,25** ***	**-0,39** ***	**0,04**	**0,43**	**1,61** ***	**0,48** ***	**0,34** ***	**0,99**	**183**
	0,04	*0,05*	*0,12*	*0,08*	*0,29*	*0,54*	*0,03*	*0,09*		
Transport equipment	**0,06**	**0,22** *	**-0,37**	**0,09**	**-1,07** ***	**-0,41**	**0,05** *	**-0,07**	**0,43**	**214**
	0,09	*0,12*	*0,25*	*0,24*	*0,13*	*0,47*	*0,03*	*0,19*		
Wearing apparel	**0,20** **	**0,02**	**-0,05** **	**-0,07**	**-0,01**	**-0,57**	**0,19** ***	**-0,13**	**0,20**	**188**
	0,10	*0,15*	*0,03*	*0,09*	*0,16*	*0,60*	*0,04*	*0,11*		
Wood products	**-0,49** ***	**1,07** ***	**-0,78** ***	**1,19** ***	**-0,33**	**-5,62** ***	**0,44** ***	**-0,09** **	**0,94**	**227**
	0,07	*0,08*	*0,15*	*0,21*	*0,46*	*1,43*	*0,04*	*0,04*		

1- The estimated parameters are in **bold** type while standard errors are in *italic*.
2- ***,**,* significant respectively at the 1,5 et 10 % level.
3- All the standard error estimates are produced with White's matrix to account for potential heteroscedasticity

Table 4: Imports capturing a **Substitution effect** in the **Developing countries**

Industry	Imports		Dom Conso		R. cost *Ind*		Conso *Ind*		R. cost *Dev*		conso *Dev*		Estb.		Total Estb.		R2	N.Obs.
	$dlogM_i e_{ii}$		$dlogX_{.,i} e_{ii}$		$d(w_{ii}/\overline{w_{Ind}})e_{i,Ind}$		$dlogX_{.,Ind} e_{i,Ind}$		$d(w_{ii}/\overline{w_{Dev}})e_{i,Dev}$		$dlogX_{.,Dev} e_{i,Dev}$		$dlogN_{ii}$		$dlogN_{.i}$			
	$-\rho_{Dom}$		$\beta_{Dom}+\rho_{dom}$		$-\eta_{Ind}$		β_{Ind}		$-\eta_{Dev}$		β_{Dev}		$\beta_{N_{.i}}$		$\beta_{N_{.i}}$			
Beverages	**0,00**		**0,31**	***	**0,61**		**1,62**	***	**-0,97**	*	**0,58**		**0,13**	***	**0,10**	**	**0,47**	**402**
	0,01		*0,03*		*1,21*		*0,24*		*0,52*		*0,59*		*0,03*		*0,05*			
Fab. metal products	**-0,30**	***	**0,75**	***	**-12,02**	***	**1,49**	***	**-2,57**	***	**-1,77**	***	**0,42**	***	**0,15**	***	**0,79**	**485**
	0,04		*0,06*		*2,27*		*0,20*		*0,88*		*0,58*		*0,03*		*0,04*			
Food products	**0,08**	***	**0,15**	***	**-4,11**	***	**0,38**	***	**0,42**		**1,75**	***	**0,26**	***	**0,42**	***	**0,89**	**513**
	0,02		*0,02*		*1,12*		*0,05*		*0,65*		*0,12*		*0,02*		*0,04*			
Footwear	**0,07**	*	**0,13**	***	**-0,63**		**1,29**	***	**-0,29**		**0,87**	***	**0,45**	***	**0,51**	***	**0,49**	**319**
	0,04		*0,04*		*0,45*		*0,27*		*0,25*		*0,29*		*0,05*		*0,13*			
Furniture	**-0,14**	***	**0,46**	***	**-1,46**	*	**1,08**	***	**-1,91**	***	**-1,57**	***	**0,31**	***	**0,61**	***	**0,68**	**410**
	0,02		*0,04*		*0,76*		*0,32*		*0,60*		*0,47*		*0,03*		*0,07*			
Glass and products	**-0,08**		**0,33**	***	**-12,45**	***	**-0,12**		**0,81**	*	**-1,93**	***	**0,41**	***	**-0,27**	*	**0,44**	**352**
	0,05		*0,05*		*1,88*		*0,21*		*0,48*		*0,30*		*0,04*		*0,15*			
Industrial chemicals	**0,11**		**0,44**	***	**-2,64**	**	**2,33**	***	**-0,07**		**-0,04**		**0,42**	***	**0,08**		**0,55**	**398**
	0,08		*0,09*		*1,30*		*0,42*		*0,33*		*0,12*		*0,04*		*0,06*			
Iron and steel	**-0,12**	**	**0,24**	***	**5,13**	***	**0,75**	***	**-0,43**	**	**0,65**		**0,09**	***	**-0,62**	***	**0,51**	**285**
	0,05		*0,06*		*1,11*		*0,18*		*0,22*		*0,50*		*0,03*		*0,08*			
Leather products	**0,07**	**	**0,18**	***	**-1,62**	***	**1,41**	***	**0,01**		**0,44**	**	**0,41**	***	**0,43**	***	**0,76**	**380**
	0,03		*0,04*		*0,53*		*0,16*		*0,29*		*0,22*		*0,04*		*0,09*			
Machinery, electric	**-0,07**		**0,24**	***	**-0,31**		**-1,24**	**	**0,01**		**1,44**	**	**0,61**	***	**-0,18**		**0,32**	**428**
	0,07		*0,08*		*0,95*		*0,55*		*0,02*		*0,63*		*0,05*		*0,19*			
Machinery	**-0,03**		**0,18**	***	**1,61**	*	**1,82**	***	**0,09**		**-0,46**	*	**0,55**	***	**-0,11**		**0,45**	**384**
	0,07		*0,07*		*0,87*		*0,25*		*0,71*		*0,28*		*0,04*		*0,31*			
Misc. petroleum	**-0,11**	***	**0,49**	***	**-2,73**		**2,07**		**2,31**	***	**3,36**	***	**0,32**	***	**-0,03**		**0,62**	**184**
	0,04		*0,05*		*3,71*		*1,68*		*0,21*		*0,68*		*0,06*		*0,15*			
Non-ferrous metals	**-0,20**	***	**0,08**	***	**-0,35**		**0,74**	***	**0,22**	***	**0,17**	***	**0,70**	***	**1,34**	***	**0,63**	**258**
	0,07		*0,02*		*0,53*		*0,12*		*0,09*		*0,04*		*0,06*		*0,35*			
Other chemicals	**-0,04**		**0,32**	***	**7,91**	***	**0,67**	*	**0,03**		**-0,30**		**0,32**	***	**0,01**		**0,39**	**425**
	0,04		*0,04*		*1,49*		*0,35*		*0,27*		*0,36*		*0,03*		*0,06*			
Other manuf. Prod.	**-0,18**	***	**0,37**	***	**-0,84**		**-0,04**		**0,02**		**-0,01**		**0,42**	***	**0,25**		**0,53**	**399**
	0,03		*0,04*		*0,55*		*0,19*		*0,05*		*0,26*		*0,03*		*0,23*			
Other non-metal. prod.	**0,03**		**0,38**	***	**-17,82**	***	**-0,35**		**-0,75**	***	**0,23**	***	**0,34**	***	**0,34**	***	**0,67**	**429**
	0,02		*0,04*		*5,46*		*0,54*		*0,07*		*0,04*		*0,03*		*0,04*			
Paper and products	**-0,19**	***	**0,51**	***	**-7,13**	**	**-0,32**		**-1,31**	***	**1,22**	***	**0,39**	***	**-0,45**	***	**0,50**	**450**
	0,05		*0,05*		*3,05*		*0,30*		*0,49*		*0,36*		*0,03*		*0,08*			
Petroleum refineries	**-0,09**	*	**0,24**	***	**0,29**		**-0,36**		**-0,51**		**-0,50**		**0,03**		**0,38**	***	**0,20**	**223**
	0,05		*0,06*		*0,68*		*0,93*		*0,71*		*1,37*		*0,06*		*0,08*			
Plastic products	**-0,09**	**	**0,51**	***	**-1,85**		**0,58**	***	**-1,16**		**-0,69**		**0,54**	***	**0,25**	***	**0,63**	**392**
	0,04		*0,05*		*2,09*		*0,17*		*0,73*		*0,64*		*0,04*		*0,09*			
Pottery, china	**-0,14**	***	**0,29**	***	**-0,96**		**0,15**		**2,69**	***	**0,81**	***	**0,25**	***	**0,46**	***	**0,76**	**334**
	0,04		*0,04*		*0,98*		*0,10*		*0,38*		*0,10*		*0,03*		*0,05*			
Printing and publishing	**-0,01**		**0,22**	***	**-1,01**		**-0,44**		**0,46**		**-0,36**		**0,19**	***	**-0,05**		**0,34**	**443**
	0,02		*0,02*		*1,34*		*0,53*		*0,64*		*0,40*		*0,02*		*0,05*			
Professional & scientific	**-0,19**	**	**0,43**	***	**-0,75**		**0,18**	*	**1,34**		**-1,70**	***	**0,59**	***	**0,47**	***	**0,49**	**287**
	0,09		*0,11*		*0,49*		*0,10*		*1,46*		*0,22*		*0,05*		*0,15*			
Rubber products	**-0,19**	***	**0,62**	***	**-1,18**		**0,24**		**-1,18**	*	**1,84**	***	**0,49**	***	**0,82**	***	**0,73**	**392**
	0,05		*0,05*		*1,46*		*0,21*		*0,61*		*0,63*		*0,04*		*0,08*			
Textiles	**0,06**	***	**0,14**	***	**-0,25**		**2,75**	***	**-1,63**	***	**1,62**	***	**0,49**	***	**0,22**	***	**0,87**	**502**
	0,02		*0,03*		*1,30*		*0,27*		*0,27*		*0,26*		*0,02*		*0,05*			
Tobacco	**-0,04**	***	**0,21**	***	**-4,77**		**-0,46**		**0,09**		**-0,53**	**	**0,43**	***	**0,00**		**0,52**	**282**
	0,01		*0,03*		*3,72*		*1,71*		*0,17*		*0,26*		*0,03*		*0,04*			
Total manufacturing	**0,10**	**	**0,41**	***	**0,66**		**0,06**		**-2,61**	***	**2,57**	***	**0,28**	***	**0,31**	***	**0,88**	**473**
	0,04		*0,04*		*0,45*		*0,13*		*0,50*		*0,34*		*0,02*		*0,06*			
Transport equipment	**-0,31**	***	**0,50**	***	**-0,12**		**0,39**		**-0,21**		**-0,55**		**0,30**	***	**0,19**		**0,26**	**425**
	0,07		*0,07*		*1,23*		*0,39*		*0,39*		*0,44*		*0,04*		*0,20*			
Wearing apparel	**-0,07**		**0,48**	***	**0,14**		**0,55**		**0,04**		**-0,09**		**0,26**	***	**-0,13**	**	**0,35**	**264**
	0,05		*0,07*		*0,47*		*0,43*		*0,40*		*0,24*		*0,04*		*0,07*			
Wood products	**-0,09**	***	**0,17**	***	**-0,04**		**0,03**		**0,27**		**-0,53**		**0,58**	***	**-0,01**		**0,56**	**471**
	0,02		*0,03*		*0,97*		*0,16*		*0,21*		*0,44*		*0,03*		*0,04*			

1- The estimated parameters are in **bold** type while standard errors are in *italic*.
2- ***,**,* significant respectively at the 1,5 et 10 % level.
3- All the standard error estimates are produced with White's matrix to account for potential heteroscedasticity

Table 5: Imports capturing a **Demand effect** in the **OECD countries**

Industry	R. Dom Cost		Imports		R. cost *Ind*		Conso *Ind*		R. Cost *Dev*		Conso *Dev*		Estb.		R2	N.Obs.
	$d(w_{ii}/\overline{w_{Dom}})e_{i,Dom}\frac{1}{1-S_{ii}}$		$dlogM_ie_{ii}$		$d(w_{ii}/\overline{w_{Ind}})e_{i,Ind}$		$dlogX_{.,Ind}e_{i,Ind}$		$d(w_{ii}/\overline{w_{Dev}}).e_{i,Dev}$		$dlogX_{.,Dev}e_{i,Dev}$		$dlogN_{ii}$			
	$-\eta_{Dom}$		β_{Dom}		$-\eta_{Ind}$		β_{Ind}		$-\eta_{Dev}$		β_{Dev}		$\beta'_{N_{ii}}$			
Beverages	**0,02**		**-0,01**		**-0,90**	**	**2,11**	***	**0,23**		**-2,08**		**0,25**	***	**0,62**	**222**
	0,02		*0,04*		*0,38*		*0,22*		*0,51*		*1,55*		*0,04*			
Fab. metal products	**-0,04**		**-0,18**	***	**1,07**	***	**2,15**	***	**-1,33**	**	**-2,91**	***	**0,53**	***	**0,77**	**208**
	0,03		*0,05*		*0,36*		*0,42*		*0,53*		*1,05*		*0,02*			
Food products	**0,16**	***	**0,22**	***	**0,06**		**0,64**	***	**-0,04**		**-0,53**		**0,60**	***	**0,87**	**208**
	0,05		*0,03*		*0,42*		*0,21*		*0,57*		*0,68*		*0,04*			
Footwear	**0,17**	***	**0,21**		**-0,32**	***	**0,22**		**-0,53**		**3,28**	***	**0,80**	***	**0,49**	**231**
	0,06		*0,14*		*0,11*		*0,16*		*0,72*		*1,15*		*0,05*			
Furniture	**-0,38**	***	**0,10**	**	**0,17**		**0,68**	***	**-2,02**	***	**-0,18**		**0,54**	***	**0,84**	**227**
	0,04		*0,04*		*0,18*		*0,18*		*0,48*		*1,00*		*0,04*			
Glass and products	**0,09**		**-0,33**	***	**0,22**		**2,68**	***	**-0,84**		**-2,55**		**0,17**	***	**0,39**	**231**
	0,06		*0,10*		*0,49*		*0,34*		*0,93*		*2,66*		*0,05*			
Industrial chemicals	**-0,15**		**0,26**	***	**0,49**	**	**0,28**		**-3,51**	***	**0,96**		**0,37**	***	**0,63**	**213**
	0,09		*0,05*		*0,23*		*0,21*		*0,51*		*0,68*		*0,02*			
Iron and steel	**0,40**	***	**0,29**	***	**0,20**		**0,03**		**-0,38**		**-2,31**	***	**0,08**	**	**0,26**	**183**
	0,09		*0,04*		*0,13*		*0,12*		*0,25*		*0,73*		*0,04*			
Leather products	**0,02**	*	**0,35**	***	**-0,22**	**	**0,19**	***	**-0,05**		**1,59**	***	**0,33**	***	**0,83**	**241**
	0,01		*0,02*		*0,09*		*0,06*		*0,28*		*0,33*		*0,03*			
Machinery, electric	**0,14**	**	**0,13**	***	**0,12**		**0,36**		**0,00**		**0,02**		**0,15**	***	**0,22**	**192**
	0,07		*0,04*		*0,13*		*0,22*		*0,01*		*0,40*		*0,02*			
Machinery	**-0,01**		**0,18**	***	**0,11**		**0,05**		**-0,33**	**	**-0,76**	**	**0,13**	***	**0,13**	**175**
	0,02		*0,05*		*0,08*		*0,15*		*0,16*		*0,31*		*0,04*			
Misc. petroleum	**0,35**	***	**0,46**	***	**-0,40**	**	**-0,80**	***	**1,20**	***	**1,10**		**0,39**	***	**0,54**	**189**
	0,05		*0,04*		*0,19*		*0,25*		*0,39*		*0,88*		*0,05*			
Non-ferrous metals	**-0,15**		**0,24**	***	**-0,37**	*	**-0,04**		**1,73**	***	**-0,24**		**0,31**	***	**0,27**	**208**
	0,13		*0,05*		*0,21*		*0,10*		*0,62*		*0,40*		*0,07*			
Other chemicals	**0,22**	***	**0,08**		**0,42**		**0,06**		**-0,85**	*	**-1,10**		**0,23**	***	**0,21**	**218**
	0,06		*0,06*		*0,27*		*0,30*		*0,45*		*1,15*		*0,04*			
Other manuf. Prod.	**0,06**		**0,17**	**	**-0,18**	*	**0,44**	***	**-0,01**		**0,21**		**0,57**	***	**0,68**	**213**
	0,05		*0,08*		*0,10*		*0,13*		*0,21*		*0,43*		*0,04*			
Other non-metal. prod.	**0,00**		**-0,16**	***	**-0,40**		**0,80**		**2,18**	***	**1,64**		**0,59**	***	**0,73**	**219**
	0,02		*0,04*		*0,52*		*0,60*		*0,69*		*1,26*		*0,03*			
Paper and products	**0,17**	**	**-0,17**	***	**-1,19**	***	**2,22**	***	**1,55**	**	**3,44**	**	**0,07**	**	**0,47**	**233**
	0,08		*0,06*		*0,28*		*0,29*		*0,79*		*1,51*		*0,03*			
Petroleum refineries	**0,07**	**	**-0,02**		**-0,14**		**0,19**		**-0,27**		**-1,23**		**0,08**	***	**0,12**	**190**
	0,04		*0,03*		*0,12*		*0,15*		*0,36*		*0,88*		*0,02*			
Plastic products	**-0,18**	***	**0,07**		**-0,02**		**0,97**	***	**0,12**		**-9,83**	***	**0,55**	***	**57,00**	**234**
	0,03		*0,05*		*0,30*		*0,36*		*1,22*		*2,55*		*0,04*			
Pottery, china	**0,49**	***	**0,33**	***	**-0,83**	**	**0,49**	***	**-0,04**		**1,82**	**	**0,24**	***	**0,74**	**230**
	0,12		*0,06*		*0,38*		*0,13*		*0,61*		*0,72*		*0,04*			
Printing and publishing	**-0,01**		**0,08**	***	**-0,03**		**-0,28**		**-2,04**	**	**3,31**	***	**0,16**	***	**0,13**	**215**
	0,03		*0,03*		*0,37*		*0,57*		*0,80*		*1,09*		*0,02*			
Professional & scientific	**0,08**		**0,27**	***	**0,08**		**0,29**		**-1,47**	**	**0,84**	**	**0,31**	***	**0,77**	**184**
	0,08		*0,05*		*0,24*		*0,21*		*0,64*		*0,35*		*0,06*			
Rubber products	**-0,19**	**	**0,14**		**-0,21**		**2,53**	***	**-2,01**	***	**6,61**	***	**0,99**	***	**0,61**	**233**
	0,10		*0,11*		*0,36*		*0,37*		*0,77*		*2,17*		*0,06*			
Textiles	**0,03**		**0,20**	***	**-0,14**		**0,83**	***	**-0,47**	*	**-0,29**		**0,56**	***	**0,90**	**235**
	0,08		*0,04*		*0,15*		*0,18*		*0,27*		*0,87*		*0,02*			
Tobacco	**0,00**		**0,02**		**-0,38**		**0,10**		**-0,48**		**-0,12**		**0,14**	***	**0,05**	**218**
	0,02		*0,02*		*0,34*		*0,29*		*0,34*		*1,17*		*0,03*			
Total manufacturing	**0,09**	***	**0,38**	***	**-0,03**		**0,17**	**	**-0,61**	**	**2,01**	***	**0,55**	***	**0,98**	**176**
	0,02		*0,03*		*0,12*		*0,08*		*0,26*		*0,51*		*0,03*			
Transport equipment	**0,41**	***	**0,26**	***	**0,08**		**0,15**		**-1,03**	***	**-0,24**		**0,05**	*	**0,49**	**214**
	0,07		*0,04*		*0,23*		*0,22*		*0,12*		*0,43*		*0,03*			
Wearing apparel	**-0,01**	*	**0,18**	***	**-0,08**	***	**0,07**		**0,04**		**-0,75**		**0,18**	***	**0,18**	**192**
	0,00		*0,04*		*0,02*		*0,08*		*0,16*		*0,56*		*0,04*			
Wood products	**0,03**		**0,08**		**-1,04**	***	**-0,94**	***	**1,92**	***	**-0,36**		**0,79**	***	**0,82**	**222**
	0,03		*0,08*		*0,24*		*0,27*		*0,73*		*2,14*		*0,03*			

1- The estimated parameters are in **bold** type while standard errors are in *italic*.
2- ***,**,* significant respectively at the 1,5 et 10 % level.
3- All the standard error estimates are produced with White's matrix to account for potential heteroscedasticity

Table 6: Imports capturing a **Demand effect** in the **Developing countries**

Industry	R. Dom Cost	Imports	R. cost *Ind*	Conso *Ind*	R. Cost *Dev*	Conso *Dev*	Estb.	R2	N.Obs.
	$d(w_{ii}/\overline{w_{Dom}})e_{i,Dom}\frac{1}{1-S_{ii}}$	$dlogM_ie_{ii}$	$d(w_{ii}/\overline{w_{Ind}})e_{i,Ind}$	$dlogX_{.,Ind}e_{i,Ind}$	$d(w_{ii}/\overline{w_{Dev}}).e_{i,Dev}$	$dlogX_{.,Dev}e_{i,Dev}$	$dlogN_{ii}$		
	$-\eta_{Dom}$	β_{Dom}	$-\eta_{Ind}$	β_{Ind}	$-\eta_{Dev}$	β_{Dev}	β'_{N_i}		
Beverages	**0,00**	**0,05 *****	**1,55**	**2,21 *****	**-0,88**	**0,89**	**0,15 *****	**0,33**	**403**
	0,00	*0,02*	*1,33*	*0,24*	*0,57*	*0,65*	*0,03*		
Fab. metal products	**-0,10 *****	**0,02**	**-10,06 *****	**1,22 *****	**-2,49 ****	**-1,50 ****	**0,57 *****	**0,56**	**485**
	0,03	*0,04*	*2,64*	*0,22*	*1,02*	*0,67*	*0,02*		
Food products	**-0,02 *****	**0,35 *****	**-4,89 *****	**0,37 *****	**-0,29**	**1,87 *****	**0,36 *****	**0,78**	**515**
	0,01	*0,02*	*1,26*	*0,06*	*0,75*	*0,13*	*0,02*		
Footwear	**-0,04 *****	**0,15 *****	**0,29**	**1,51 *****	**-0,69 *****	**0,65 ****	**0,47 *****	**0,31**	**325**
	0,01	*0,03*	*0,42*	*0,22*	*0,24*	*0,27*	*0,05*		
Furniture	**-0,02 *****	**0,01**	**-0,52**	**1,06 *****	**-1,24 ***	**-0,22**	**0,52 *****	**0,27**	**412**
	0,01	*0,03*	*0,60*	*0,32*	*0,74*	*0,60*	*0,03*		
Glass and products	**0,00**	**0,02**	**-5,44 *****	**-0,71 *****	**0,33**	**-1,71 *****	**0,49 *****	**0,19**	**352**
	0,01	*0,05*	*1,52*	*0,19*	*0,50*	*0,30*	*0,04*		
Industrial chemicals	**-0,01 *****	**0,20 *****	**-3,22 ****	**0,67 ****	**0,43**	**0,29 ****	**0,52 *****	**0,38**	**399**
	0,00	*0,04*	*1,35*	*0,34*	*0,33*	*0,12*	*0,03*		
Iron and steel	**-0,02**	**0,12 *****	**7,40 *****	**0,56 *****	**-0,56 ****	**0,07**	**0,13 *****	**0,41**	**285**
	0,04	*0,04*	*0,95*	*0,18*	*0,23*	*0,54*	*0,03*		
Leather products	**0,00**	**0,21 *****	**-0,48**	**1,16 *****	**-0,51**	**0,84 *****	**0,61 *****	**0,58**	**389**
	0,00	*0,03*	*0,53*	*0,14*	*0,33*	*0,24*	*0,04*		
Machinery, electric	**0,00**	**0,06**	**-0,81**	**-0,05**	**0,00**	**0,76**	**0,62 *****	**0,20**	**430**
	0,04	*0,04*	*0,57*	*0,32*	*0,02*	*0,62*	*0,05*		
Machinery	**-0,36 *****	**0,14 *****	**1,83 ****	**1,83 *****	**-1,08 ****	**-0,61 ****	**0,56 *****	**0,39**	**384**
	0,13	*0,05*	*0,87*	*0,25*	*0,48*	*0,28*	*0,04*		
Misc. petroleum	**-0,09 *****	**0,26 *****	**-4,76**	**9,33 *****	**0,29 *****	**3,59 *****	**0,38 *****	**0,38**	**184**
	0,02	*0,04*	*4,67*	*2,01*	*0,07*	*0,87*	*0,07*		
Non-ferrous metals	**-0,10 *****	**0,09 *****	**-0,76**	**0,71 *****	**-0,08 ****	**0,11 *****	**0,81 *****	**0,35**	**262**
	0,01	*0,03*	*0,50*	*0,11*	*0,04*	*0,03*	*0,06*		
Other chemicals	**-0,06 *****	**0,14 *****	**6,12 *****	**0,72 ***	**0,08**	**-0,46**	**0,37 *****	**0,22**	**425**
	0,02	*0,03*	*1,55*	*0,38*	*0,28*	*0,39*	*0,03*		
Other manuf. Prod.	**0,00**	**-0,09 *****	**-1,30 *****	**-0,43 *****	**0,00**	**0,43 ****	**0,57 *****	**0,16**	**423**
	0,01	*0,03*	*0,38*	*0,10*	*0,06*	*0,19*	*0,03*		
Other non-metal. prod.	**-0,01**	**0,01**	**-7,19**	**0,14**	**-0,08 ****	**0,02**	**0,55 *****	**0,17**	**429**
	0,01	*0,03*	*6,54*	*0,65*	*0,04*	*0,04*	*0,03*		
Paper and products	**-0,14 *****	**0,24 *****	**-7,08 ****	**-0,18**	**-1,70 *****	**1,86 *****	**0,41 *****	**0,14**	**451**
	0,03	*0,03*	*3,59*	*0,35*	*0,57*	*0,41*	*0,03*		
Petroleum refineries	**0,03 *****	**-0,07**	**0,16**	**-0,11**	**-0,15**	**-0,77**	**0,14 *****	**0,14**	**224**
	0,01	*0,06*	*0,66*	*0,85*	*0,75*	*1,44*	*0,05*		
Plastic products	**-0,03 ****	**0,15 *****	**-6,99 *****	**0,00**	**0,19**	**0,13**	**0,73 *****	**0,25**	**394**
	0,01	*0,04*	*1,21*	*0,14*	*0,81*	*0,71*	*0,04*		
Pottery, china	**-0,03 *****	**0,19 *****	**1,47**	**-0,29 *****	**2,46 *****	**0,95 *****	**0,45 *****	**0,40**	**335**
	0,01	*0,03*	*1,06*	*0,09*	*0,45*	*0,11*	*0,03*		
Printing and publishing	**0,00 ****	**0,10 *****	**-0,46**	**-0,59**	**0,47**	**-0,40**	**0,20 *****	**0,07**	**443**
	0,00	*0,02*	*1,50*	*0,59*	*0,71*	*0,45*	*0,02*		
Professional & scientific	**-0,13**	**0,19 *****	**-0,18**	**0,41 *****	**1,42**	**-1,86 *****	**0,62 *****	**0,41**	**287**
	0,15	*0,04*	*0,50*	*0,10*	*1,55*	*0,22*	*0,05*		
Rubber products	**-0,06 *****	**0,09 ***	**-2,08**	**0,29**	**-0,61**	**2,23 *****	**0,80 *****	**0,35**	**392**
	0,01	*0,05*	*1,81*	*0,26*	*0,76*	*0,78*	*0,04*		
Textiles	**0,00**	**0,16 *****	**3,32 *****	**2,87 *****	**-1,68 *****	**1,50 *****	**0,56 *****	**0,71**	**502**
	0,00	*0,02*	*1,28*	*0,28*	*0,28*	*0,27*	*0,02*		
Tobacco	**0,00 *****	**0,00**	**-4,79**	**-1,08**	**0,09**	**0,04**	**0,44 *****	**0,05**	**282**
	0,00	*0,02*	*3,94*	*1,81*	*0,18*	*0,27*	*0,03*		
Total manufacturing	**-0,05 ****	**0,52 *****	**-0,34**	**-0,34 ****	**-2,10 *****	**3,14 *****	**0,44 *****	**0,82**	**474**
	0,02	*0,03*	*0,55*	*0,15*	*0,61*	*0,39*	*0,02*		
Transport equipment	**-0,02**	**0,08 *****	**0,48**	**0,26**	**0,09**	**-0,77**	**0,34 *****	**0,13**	**425**
	0,02	*0,03*	*1,28*	*0,41*	*0,40*	*0,46*	*0,04*		
Wearing apparel	**0,01 ****	**-0,04 ****	**0,25**	**0,62 *****	**0,26**	**-0,04**	**0,31 *****	**0,09**	**296**
	0,00	*0,02*	*0,41*	*0,13*	*0,40*	*0,23*	*0,04*		
Wood products	**0,00 ****	**-0,03**	**0,35**	**0,05**	**0,21**	**-0,49**	**0,61 *****	**0,11**	**477**
	0,00	*0,02*	*0,97*	*0,16*	*0,20*	*0,42*	*0,03*		

1- The estimated parameters are in **bold** type while standard errors are in *italic*.
2- ***,**,* significant respectively at the 1,5 et 10 % level.
3- All the standard error estimates are produced with White's matrix to account for potential heteroscedasticity

This non convincing result could be simply explained from the hypothesis that wages are not capturing a pure cost effect but a mixed effect of cost and productivity, the latter biasing downward the estimate on the cost variable.

Finally, the results relative to the foreign market related variables are very similar to that shown in the prior specification of labour demand.

Table 6 reports the results for the panel of developing countries. The results are qualitatively the same than those provided by the regressions on the OECD sample. In particular, the effect of imports appears to be positive and significant for 19 sectors. Moreover, the value of the parameter appears to be smaller when compared to that of the number of the firms, which is what is expected from theory.

8 Conclusion

This paper constitutes one of the first attempts to explain why imports have not been affecting much employment at the industry level in some developing and developed countries.

While most of the literature bases its research on a substitution effect of imports, we show that a positive demand effect of imports on employment, could intervene consecutively. In fact, in an oligopolistic world, imports might be reducing prices and thus increasing total demand that benefits in return employees of domestic sellers in the market. The same demand effect appears when exporting to foreign markets. Indeed, exports can have pro-competitive effects in the host market, reducing prices and thus increasing total foreign demand, which ends up creating a positive effect on domestic employment too.

We present a simple oligopoly theory and show that it can be expressed in three different ways to allow for openness. The first theoretical relation shows how the determinants of both import and export variables could affect labour demand. The interaction of returns to scale to employment and industry market power constitutes the channel of labour adjustment to openness. This relation is then transformed in two manners. First, we reshape the equation to allow for imports to capture a pure demand effect. Then, we introduce the same vector of imports in an alternative relation in order to capture instead a pure substitution effect.

We test these two specifications on two panels of developed and developing countries, on 29 industries over the period 1981-1997. We find solid evidence on the effects of substitution and demand on domestic employment, either when selling on the home or on the industrialized and developing countries' markets.

In bilateral trade, imports from one country constitutes the exports of the other. Thus, the same effects of substitution and demand could be applied to exports. Unlike imports however, these effects are both positive on the employment of export country. In fact, by replacing foreign labor services, export countries would be employing more of domestic services (substitution effect). Moreover, an increase in exports might be reducing equilibrium prices and thus increasing total demand that benefit to the host country but also exporting countries' sellers.

We did not show however, which of the substitution or demand effect is the strongest, and thus what is the *total* impact of imports on employment. Some work related to the strategic trade policy literature, concludes that the *overall* impact of tariff barriers or transaction costs in general should be negative on employment as long as the demand function is not too convex and the variables are strategic substitutes (see Brander (1995)). Our model fails to test these hypothesis and thus does not bring a response to this purpose.

In addition, we have to mention that this paper is based on one type of labour, due to the absence of industry data by degree of qualification for the panel of countries that is used. Consequently, we cannot infer any conclusion on the relative demand for unskilled employees. *A fortiori,* we cannot drive any conclusion from this work regarding the impact of openness on income inequalities during the considered period.

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A Supplement details on the construction of the dataset

Our dataset is constructed from a merge of two databases from UNIDO. The first is indtstat3 which is a 3-Digits Industrial Statistics Database that reports data on activity such as 3-digit industry total compensation (wages and benefits), employment, production and the number of firms (ISIC rev.2). The second is the Industrial Demand-Supply Balance database (IDSB) which provides trade data with Developed and Developing countries (imports and exports) at the 4-digit industry level (ISIC rev.2 as well), easily aggregated to 3-digit. It is to be noted that IDSB does not provide information on bilateral basis. For each given country, it reports total trade (imports and exports) conducted with the developing countries on the one hand and that observed with the developed countries on the other hand. Then, by matching these two databases, we were able to construct a table of activity and trade data for 65 developed and developing countries in 29 industries between 1981-1997. We present in tables 7 and 8 the number of industries where data is available in each country finally selected over the period 1981-1997.

Matching data for different countries and periods is a difficult exercise however. While information is available for the 29 industries and the whole 1981-97 period for the United-States, we have information for 10 to 23 Danish industries depending on the year, or for 2 to 24 industries in Mauritius. Other countries did not provide information for the whole period: for instance, data on Germany end in 1994, Bangladesh in 1992, while Costa Rica's data start in 1984 only. On the whole, the worst information is available for El Salvador, Ethiopia, France, Ghana, Madagascar, Nepal, Nicaragua, Romania, South-Africa and Tunisia. Except for France, data problems are concentrated in developing countries. We did not update the database in order to authorize the replication of our results and to stick to an homogeneous data source. This is why data for European countries was not completed. Notwithstanding such unbalanced structure, the data set entails very rich information for numerous developing countries, and this comes out as a good surprise: Chile, the Hong Kong province of China, Colombia, Costa Rica, India, Indonesia, Korea, Malaysia, Mexico, Philippines, Sri Lanka, Turkey, Uruguay and Venezuela collected complete information on a regular basis.

It is to be noted that ISDB trade data are based on the United Nations Commodity Trade tapes and thus, are expected to be exhaustive by country and industry while Indstat3 database reports activity data from different sources of information. A significant proportion of this data appears to be collected from business surveys conducted by UNIDO, which suggests that wages, employment and production could be underestimated relative to their real values in national statistics.

However, we made two different types of controls before using these variables. In the first control, we noticed that the type of source from where data is gathered could vary from year to year within a pair country-industry. Hence, we simply compared the observations gathered from questionnaires to those that are reported to be compatible with national accounts a year earlier, or a year later and found coherent time series. Moreover, a second control was made in order to check whether the production, employment and wages figures were not underestimated in OECD countries. Hence, we compared data from the STAN-OECD database based on national accounts[24] to that of UNIDO and again found values that were rather similar.

[24] More rigorously, the OECD production data are estimated values from both surveys and national accounts series.

Table 7: Summary of available observations (values in the table design the number of industries observed)

Obs	Country	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	Argentina			13	27	14	11	12	13	15	9			10				
2	Australia	22	22	23	23	24	9	23	23	21	21	21	22					
3	Austria	13	13	27	27	27	25	24	23	24	22	23	21	23	22	19	18	7
4	Bangladesh	12	14	17	14	17	14	14	2	19	20	17	19					
5	Bolivia	14	12	12	12	8	11	14	14	10	12	17	24	23	22	23	25	25
6	Canada	29	29	29	29	29	29	29	29	29	29	29	29	29	28	27	27	27
7	Chile	28	28	28	27	28	28	28	28	28	27	28	29	29	28	29	29	28
8	China (Hong Kong)	23	25	26	26	25	26	25	26	26	22	23	22	20	20	19	20	25
9	Colombia	29	28	28	29	29	29	29	29	29	29	28	29	29	29	29	29	29
10	Costa Rica				23	23	25	26	25	24	23	24	23	24	25	25	25	22
11	Cyprus	25	24	25	25	24	25	24	23	24	26	26	26	26	26	26	26	26
12	Denmark	20	22	21	21	20	18	21	22	23	19	19	10	11	10	10	10	10
13	Ecuador	20	17	15	17	20	15	21	22	23	25	24	28	28	28	28	25	23
14	Egypt	17	22	23	23	19	24	28	26	28	28	28	28	28	28	28	17	
15	El Salvador	22	24	22	21	21								17	19	23	26	27
16	Ethiopia and Eritrea	11	9	9	10	6	8	9	8	8								
17	Fiji	14	13	13	12	11	12	12	12	12	12	12	12					
18	Finland	28	28	28	28	28	28	26	24	24	23	24	24		26	11	11	11
19	France	2	2	3	4	4	3	3	3	3	2	3	3					
20	Germany											23	24	26	26			
21	Germany, Western Part	29	29	29	29	27	27	27	27	27	26							
22	Ghana	9	11	9	6													
23	Greece	29	29	28	28	28	28	28	29	28	28	28	28	29	29	29	29	29
24	Guatemala	23	25	25	26	27	27	26	28			26		27	29	26		25
25	Honduras	3	3	18	17	23	3	3	3	3	25	24	25	26	27	26		
26	Iceland	10	8	11	10	11	11	12	17	16	16	14	18	17	17	19	19	
27	India	27		28	28	27	27	27	27	27	28	27	27	28	28	28	29	29
28	Indonesia	22	24	24	24	23	23	24	24	20	25	25	27	26	26	27	27	13
29	Italy	29	29	29	29	29	29	29	29	28	29	28	27	27	27			
30	Japan	27	28	28	27	29	29	29	29	29	29	29	29	29	28	28	28	28
31	Jordan	11	11	11	13	13	12	13	16	19	23	20	22	24	26	25		
32	Korea, Republic Of	27	27	27	27	27	27	27	27	27	27	28	29	29	29	29	27	27
33	Kuwait	17	15	17	18		21	16	20	18	20	14	21	23	23	22	22	23
34	Macau	23		24	9	11	24	24	17	15	14	16	15	15	13	13	12	15
35	Madagascar	14	14	15	13	14	14											
36	Malaysia	28	28	27	27	26	26	26	26	26	26	26	26	26	24	25	24	29
37	Malta	17	18	16	17	19	18	20	18	11	18	18	19	18	19	18	17	
38	Mauritius	19	20	18	5	3	20	2	3	3	22	22	23	21	22	24	22	24
39	Mexico	18	18	18	26	26	26	25	25	25	25	25	22	21	21	20	27	27

continued next page ...

Table 8: Summary of available observations (continued)

. . . *continued from previous page*

Obs	Country	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
40	Morocco	25	26	26	26	10	10	10	10	10	10	10	26	26	10	27	25	9
41	Nepal						15	8	7	7	16	6		9			11	
42	Netherlands	22	22	22	22	22	22	22	26	26	22	22	21	21	27	27	27	27
43	New Zealand	29	29	29	29	29	29	29	29	29	16	7		7	11	11	11	
44	Nicaragua	22	17	13	19	13												
45	Norway	28	29	29	29	29	29	29	29	28	28	28	26	21	22	22	23	23
46	Pakistan	25	28	27	28	23	22	25	22	25	27	23	27					
47	Panama	16	12	16	19	19	19	17	17	17	23	18	16	18	18		18	19
48	Peru		26	26	28	27	27	27	26	27	28	28	27		27			
49	Philippines	29	29	26	27	26	27		28	28	28	26	28	29	26	26	26	26
50	Portugal	27	27	27	26	26	25	25	26	26								
51	Romania										14	15	15	15				
52	Singapore	20	20	19	18	18	17	17	16	15	15	15	15	15	14	25	24	24
53	South Africa												29	23	23	23	23	23
54	Spain	29	29	29	29	29	29	29	29	29	29	29	29	28	28	28	28	28
55	Sri Lanka	27	28	28	27	27	27	27	26	27	23	24	22	25	24	26		
56	Sweden	29	28	28	28	27	27	27	27	28	26	28	28	26	27	29	29	29
57	Thailand		21		25		25		25	24	23	26		24	24			
58	Trinidad and Tobago	22	22	21	21	21	22	22	6	22	22	25	23	23	22	21		
59	Tunisia	27												16	16	16	16	16
60	Turkey	28	28	28	28	28	28	28	28	27	28	28	28	28	28	29	29	29
61	United Kingdom	29	29	29	29	29	29	29	29	29	29	29	28	25	25	28	29	29
62	United States of America	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
63	Uruguay	26	26	22	25	25	25	27	27	27	27	27	27	27	27	27	27	27
64	Venezuela	27	28	29	25	27	28	27	27	27	29	28	28	28	28	28	28	
65	Zimbabwe				26	26	26				25	25	25	24	24	23	26	26

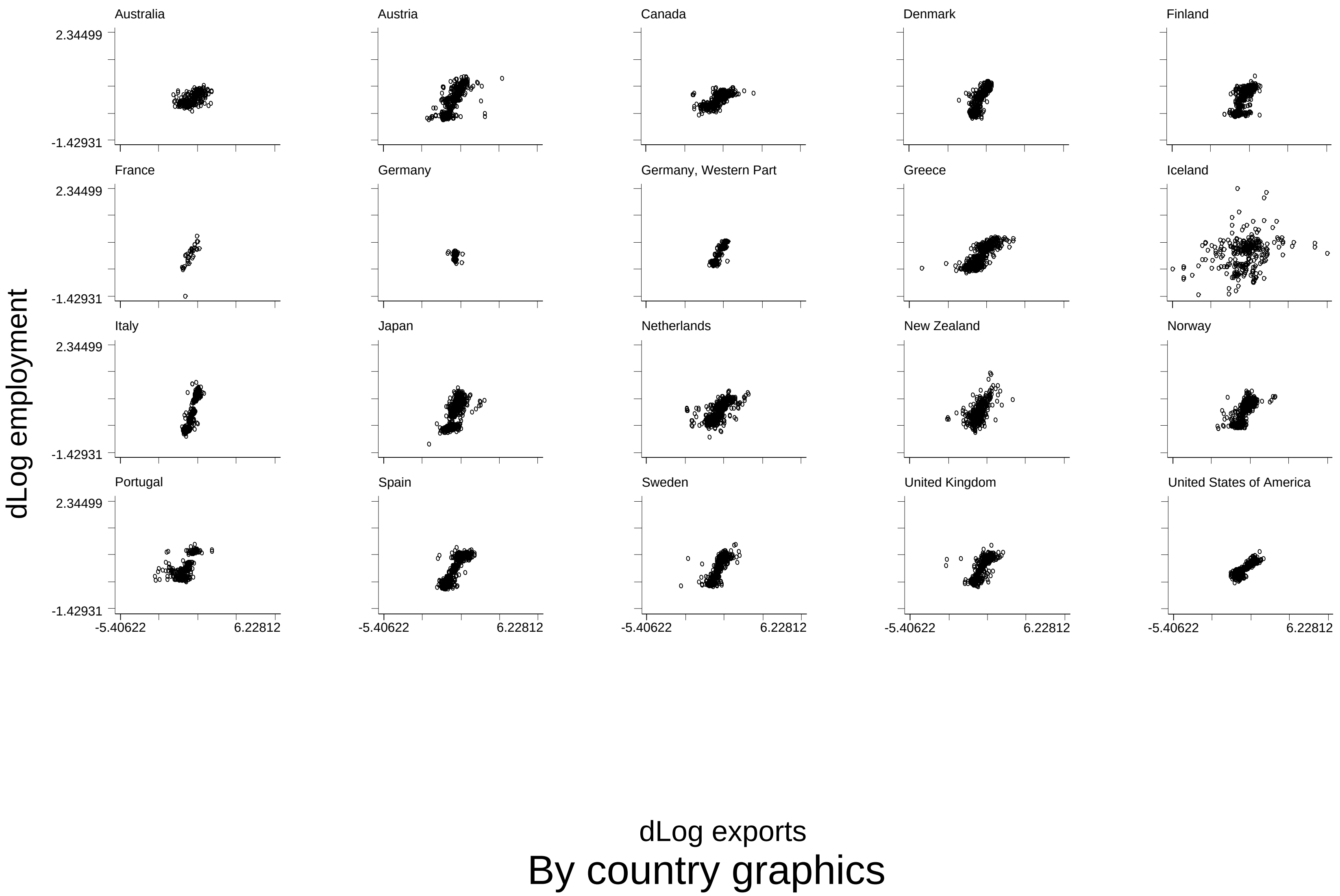

Figure 3: Industrial changes in employment related to exports in OECD countries

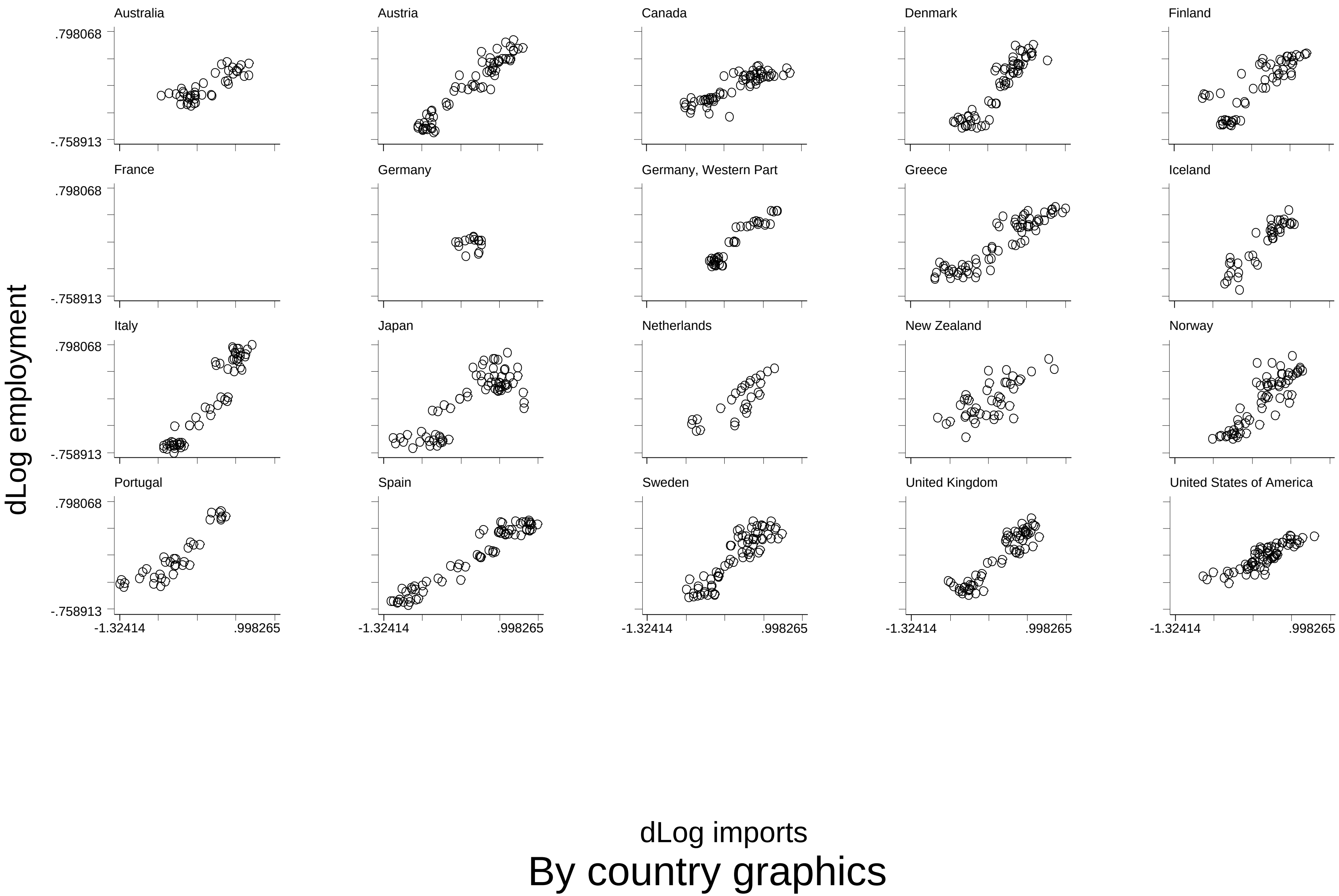

Figure 4: OECD employment changes related to imports in homogenous good industries

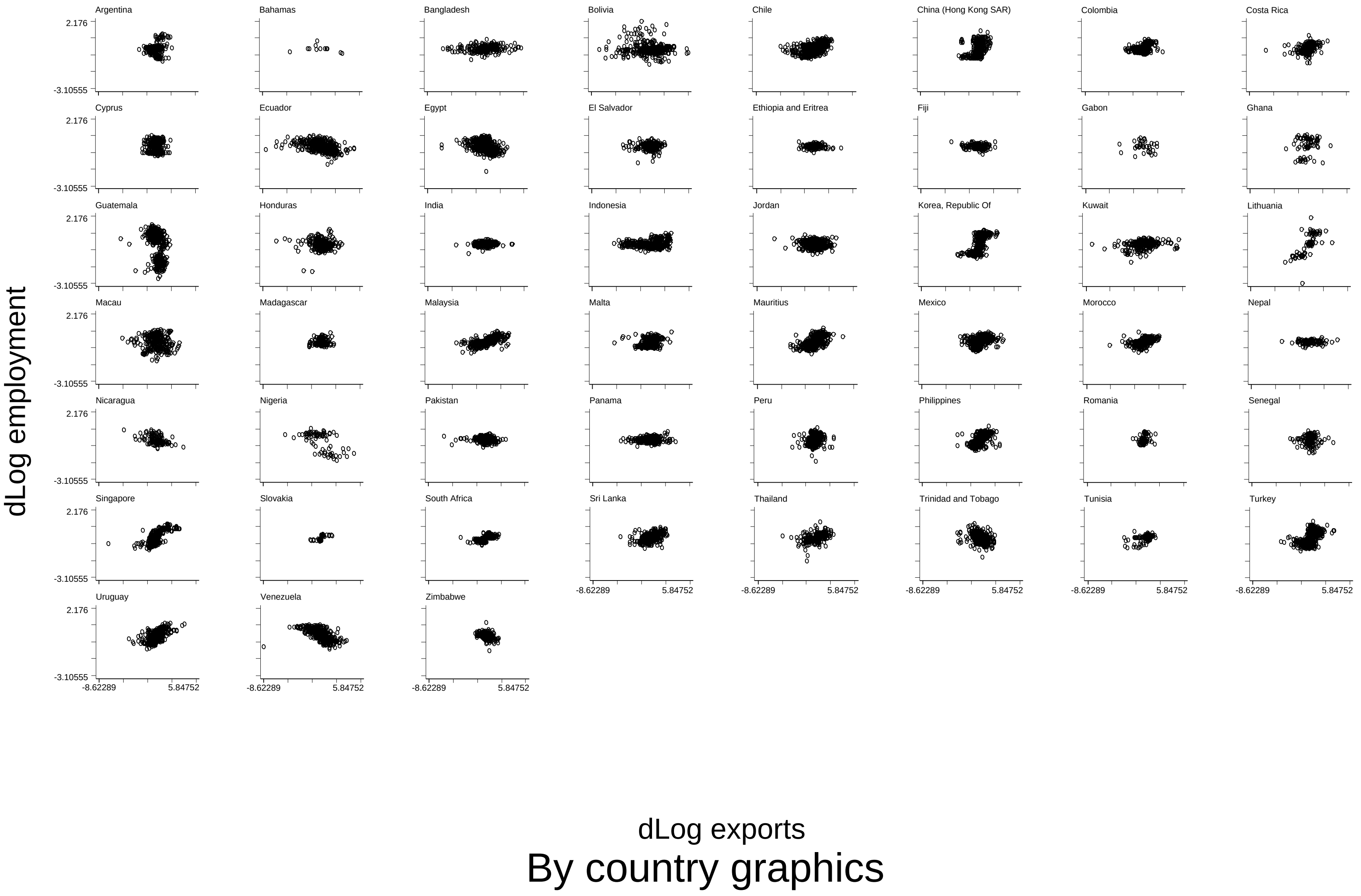

Figure 5: Industrial changes in employment related to exports in **Developing** countries

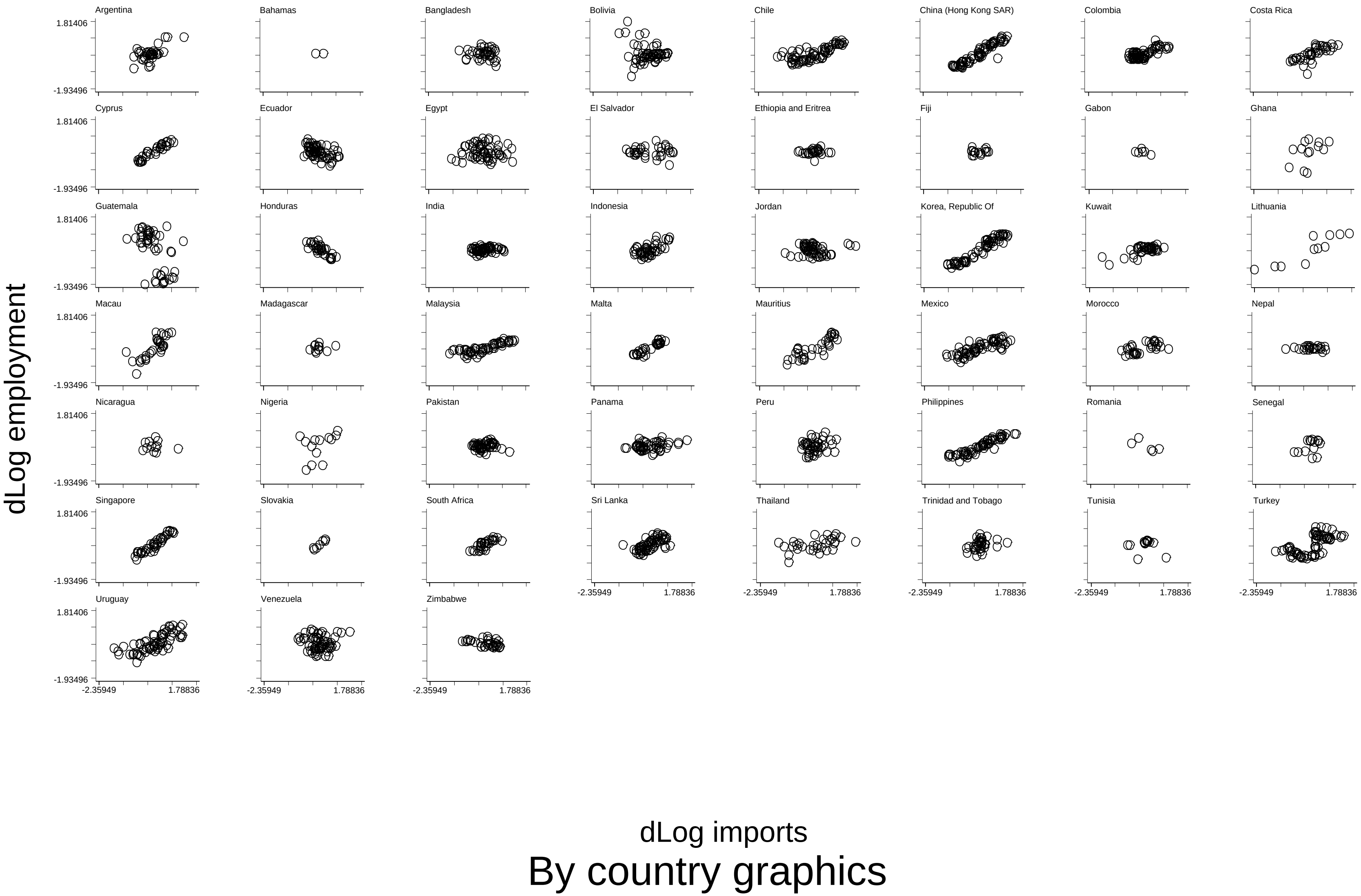

Figure 6: Developing countries employment changes related to imports in homogenous good industries

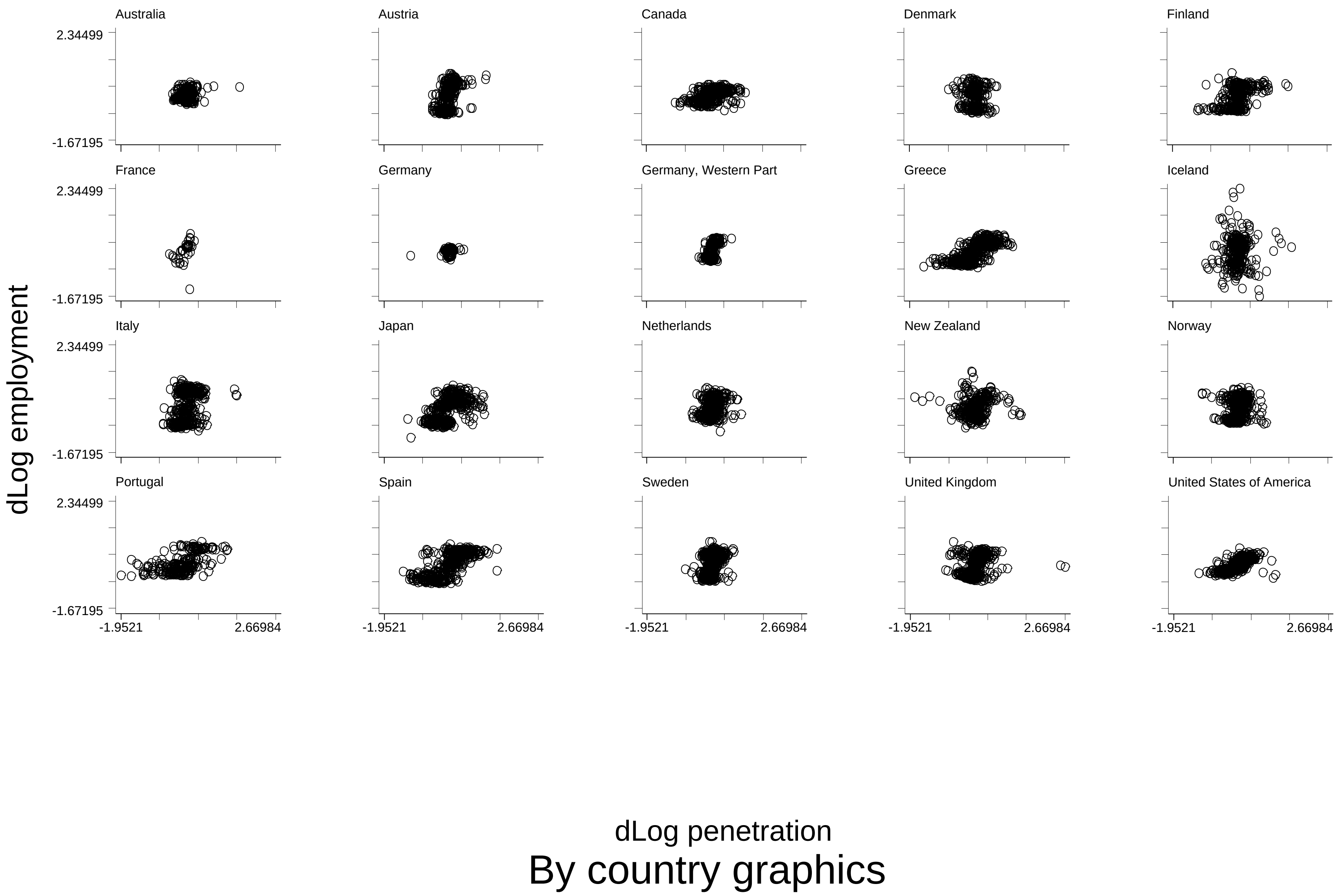

Figure 7: Industrial changes in employment related to **penetration** rates in **OECD** countries

Figure 8: Industrial changes in employment related to **penetration** rates in **Developing** countries