An empirical study of the world economic geography of manufacturing industries (1980 - 2003) *

Rodrigo Paillacar †

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Abstract

New Economic Geography (NEG) theories predict that international spatial disparities in wages can be explained by the market or supplier access of countries. These variables can be built using trade flows. I consider alternative methods, as well as controls for skill sorting and labor adjustment to assess the robustness of this relationship. I perform regressions for 27 industrial sectors covering 24 years. The results indicate that alternative methods for the construction of the NEG variables are important to obtain robust coefficients, but the differences at industry level seem to matter the most. In panel regressions, 25 sectors exhibit a favorable evidence of the impact of market access on wages. When labor adjustment is considered, we still have 16 sectors exhibiting wage responses to market access. Two industries do not present a wage response at all. Some simulations suggest that components of the market access can have differentiated impacts on Developing and Developed countries.

Keywords: Economic Geography, Market Access, Supplier Access, Spatial Inequality, Spatial Adjustment, Wage Equation.

JEL classification: F12, F16.

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†Centre d'Economie de la Sorbonne (Université de Paris 1 and CNRS) and Paris School of Economics. 106-112 Boulevard de l'Hôpital 75647 Paris Cedex 13, France. E-mail: rodrigo.paillacar@univ-paris1.fr

1 Introduction

Since the eighties, the world economic geography for the manufacturing sector has experienced important changes. While most of the production is still agglomerated close to the greatest demand centers, standardized technologies and reduction in trade costs (i.e. globalization) lead to a more dispersed structure in some industries. The interplay of proximity to demand (often called market potential or market access), input prices and trade costs is central in theories aiming to explain agglomeration processes in manufacturing (for instance, the seminal contribution by Krugman, 1991). The empirical counterpart has exploited with success the cross-country differences in market potentials to explain income levels (Redding and Venables, 2004) or firm location choices (Head and Mayer, 2004a).

Figure 1 provides some illustrations of the varying importance of this production - demand linkage. It shows the change in a rank of the market potential for 4 manufacturing sectors between 1980 and 2003. Darker colored countries correspond to countries experiencing important progress in the market access. Details of the measure are presented in the section 4.2. In this part, I just underline the fact that two sectors exhibit important changes in countries' market potential suggesting a redispersion (*Textiles* and *Iron & Steel*), while two others (*Tobacco*, and *Professional & Scientific Equipment*) seem to show lower evidence of spatial deconcentration, with Developed economies retaining their high ranks in the beginning of the period. Economic geography models predict a relationship between this measure of market potential and wages in the short run. In the long run, firms relocate to places with lower wages, and subsequent industrialization can change the market potential or weaken the demand linkage, leading to dispersion. Moreover, the globalization process should entail a reduction in trade costs, potentially stimulating these relocations. In practice, dispersion can be very slow because of technological differences, country specialization, specific factors of production, labor and fiscal regulations, etc. All these aspects can operate at a very specific industrial level, leading to different market potential evolutions, as suggested by the Figure 1.

To identify the impact of the economic geography, researchers exploited the emphasis given by the theory to the impact of demand proximity on profits. As a consequence, the higher wages that firms can afford to pay in a chosen location are positively correlated to market access. The main strategy of identification has relied on cross-country regressions of GDP per capita on aggregated market access. There are two important potential improvements to this approach. First, identification in the time dimension enables to better control for differences in technical efficiency (and other country heterogeneity sources of variation). Second, industry heterogeneity can be considered if the dependent variable is an industry-specific wage instead of GDP per capita. As Figure 1 suggests, market access follows different trajectories in different sectors.

In this paper, I determine in which sectors, wages are more responsive to market access evolutions. Two version of the market access are considered, as well as an important number of robustness checks are performed, including dynamic panel data regressions. I find evidence of robust coefficients for 16 out of 27 industries. The results also suggest that internal flows have to be included to generate the market access variable, as Mayer (2008) does. Market access elasticities for these 16 sectors range between 10 and 37%. This is much lower than Redding and Venables (2004)'s cross-section estimates, but close to the most recent studies, performed at aggregated level and using panel data (Mayer, 2008; Boulhol and de Serres, 2008).

I also investigate through simulations how the different modalities of trade integration (incorporation to Regional Trade Agreements (RTA) and to World Trade Organization (WTO), two alternatives to improve market access) influence manufacturing wages. While results aforementioned suggest a robust relationship between economic geography and wage evolutions for the 16 industries, impacts widely vary across countries. An important part of the spatial competitiveness changes slowly, and several peripheral countries will have to wait until new demand centers will arise, as it has been the case for Asia in the last quarter century. Trade integration policies, can have important effects, specially for isolated countries and for nations strategically located close to the richest markets.

The rest of the paper will proceed as follows: Section 2 will present some aspects of the theoretical framework (see appendix for more details), and summarizes some implications for the empirical part; Section 3 will present the estimation strategies and data; Section 4 reports findings as well as some simulations to assess the potential impact of trade in market access; and Section 5 concludes.

2 Theoretical background

I consider a monopolistic competition framework with product differentiation, including firm-level increasing returns to scale, symmetric trade costs and homogeneous firms. The theoretical result shows that, under a zero profit condition, a positive relationship between market access and regional wages could be established, called "NEG wage equation": firms are willing to pay higher wages in regions that are close to large markets, since firms in these regions are able to deliver goods to markets at low transport costs. I follow the standard framework as developed by Fujita et al. (1999). Details of the model are presented in the Appendix. There are two sectors in the economy. The first (A-sector) is characterized by constant returns, perfect competition and no trade costs. This sector offsets all trade imbalances in the other sector, thus permitting spatial specialization. The second sector (M-sector) produces an horizontally differentiated good with trade costs. The production function for this sector includes a fixed cost per plant f_i, and a constant marginal cost m_i. Hence, profits of a firm in the region i are:

$$\pi = p_i q_i - m_i q_i - f_i \tag{1}$$

Profit maximization results in a constant mark-up:

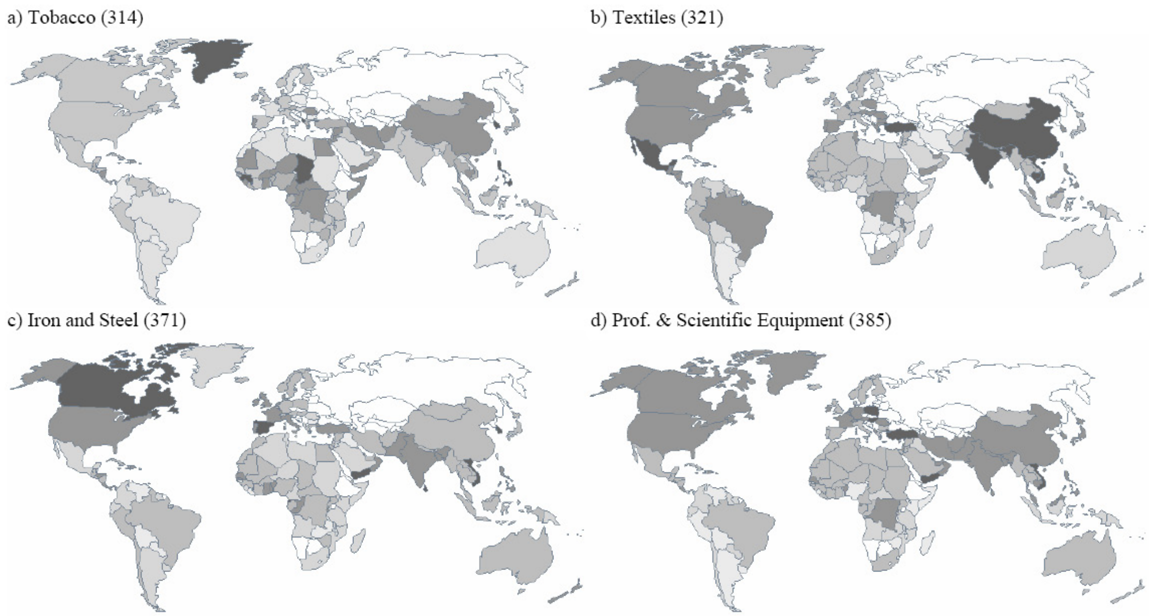

Figure 1: Market Access (HM) evolution for selected industries (1980-2003).

$$p_i = \frac{m_i \sigma}{\sigma - 1} \tag{2}$$

Using the demand function (See Appendix for details) and the fact that gross profits are given by $\pi_{ij} = p_{ij} q_{ij} / \sigma$, profits earned in each market j are defined as follows:

$$\pi_i = \frac{1}{\sigma} \left[p_i^{1-\sigma} \left(\frac{\mu Y_j}{P_j^{1-\sigma}} \right) \phi_{ij} \right] - f_i \tag{3}$$

I adopted the notation of Baldwin et al. (2003) using the term *free-ness* (*phi-ness*) of trade, $\phi_{ij} \equiv \tau_{ij}^{1-\sigma}$, that represents the combined impact of (1) trade costs (τ) and (2) the elasticity of substitution on demand (σ). When these variables are too high, trade becomes prohibitive, and only the local demand is relevant ($\phi_{ij} = 0$). A frictionless world is represented by a $\phi_{ij} = 1$. μY_j corresponds to the importer expenditure devoted to the M-good. The price index, $P_j^{1-\sigma}$, is defined as the sum over the prices of individual varieties (See Appendix for the derivation) and reflects the potential suppliers of this market, considering trade costs, the elasticity of substitution, and the prices they charge. In this sense, it could be considered as a measure of the market crowding: it is in a well served nation where a high competition is expected, and therefore lower product prices. This term is also mentioned in the literature as a *multilateral* *resistance term*. Net profit in each potential location i, are the sum of the profits from all locations j using equation (3):

$$\Pi_i = \frac{1}{\sigma}\left[\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} m_i^{1-\sigma} \underbrace{\sum_j^R \left(\frac{\mu Y_j}{P_j^{1-\sigma}}\phi_{ij}\right)}_{MA_i}\right] - f_i$$

The term in the sum is called *Market Access* or *Real Market Potential*, and is usually abbreviated as MA, where MA_i is defined as the sum of the final demand addressed to region i, weighted by the accessibility from i to these markets j (since it considers ϕ_{ij}) and by the market crowding level of every region j (since it considers the price index $P_j^{1-\sigma}$).

The spatial equilibrium can be achieved under the hypothesis that all firms will earn the same profit. An iso-profit equation that normalizes the profit to zero gives us a relationship between costs and MA:

$$m_i^{\sigma-1} f_i = \frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} MA_i \tag{4}$$

2.1 The price version: Market Access and factor rewards

Tracing a more direct relationship between wages, employment and the MA requires specifying the technology and production factors considered for the M-Sector, as well as assumptions about labor mobility. In this model, labor is the only production factor.[1] The original model assumes that the A-sector employs immobile, unskilled workers (denoted with the superscript u) whereas the M-sector employs (perfectly) mobile skilled ones (superscript s):[2]

$$C_i = w_i^s l_i^s = w_i^s\,(a^s\, q_i + F^s) \tag{5}$$

In that case there is a labor need of a^s per production unit and a labor fixed requirement F^s, both common to all regions. The equation (4) becomes the "NEG wage equation" postulated by Fujita et al. (1999) that indicates which wages a firm from a given location i can afford to pay:

$$w_i^s = \left[\left(\frac{\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma}}{\sigma F^s\ [a^s]^{\sigma-1}}\right) MA_i\right]^{\frac{1}{\sigma}} \tag{6}$$

[1] Redding and Venables (2004) develop a model with labor and vertical linkages in a Cobb-Douglas function. Baldwin et al. (2003) present models with capital and labor. Head and Mayer (2006) introduces differences in Human capital across regions.

[2] Given the assumptions in relation to the A-sector, there is interregional price equalization for this good, and wage equalization for the unskilled workers as well. This allows to take the A good as numeraire: $p_i^A = w_i^u = 1$.

Up to this point, only three of the NEG theory ingredients are considered. Together with the other two, endogenous firm locations and endogenous location of demand, they give the full general equilibrium (extensively presented in Fujita et al., 1999 and Baldwin et al., 2003). These two other key elements of NEG theory represent the *quantity version*, briefly discussed in the next section.

2.2 The quantity version: Relocation and the spatial adjustment

In general equilibrium, labor migration (or alternatively, foreign direct investment) can (at least partially) eliminate the effects of market access on wages. Suppose that trade liberalization (a fall in ϕ_{ij}) affects countries unequally. This will generate differences in the market access across locations. Restoring the equilibrium demands a spatial equalization of profits. Head and Mayer (2006) explore this question by using the two extreme cases of no migration at all and completely free migration: in the first case, there is an increase in wages in higher market access regions due to higher product prices. In the other extreme, with factors migrating to high market access regions, factor price equalization holds. As a consequence, the number of firms in the region will increase in response to the decline of trade costs. This agglomeration of firms will rise the price index $P_j^{1-\sigma}$, which in turn will lower the MA in that region. As the employment level depends on the number of firms in each region ($L_i^s = n_i l_i = n_i \sigma \beta$), Head and Mayer (2006) consider the employment level as an indicator of this quantity version, and exploit spatial variations of wages and employment levels to test which version potentially prevails. In the empirical part, the quantity effect will be controlled in a similar way.

3 Empirical issues and data

3.1 Trade, Gravity and Economic Geography variables

The more complicated aspect for its correct estimation is the incorporation of the price index $P_j^{1-\sigma}$. I follow the methodology pioneered by Redding and Venables (2004), capturing the price indexes in a trade gravity equation using country fixed effects. Also the estimation of the ϕ_{ij} should be more precise because it takes into account more variables than just bilateral distance, usually the only proxy used. Moreover, introducing some trade policy variables in trade costs may provide a way to explore some policy simulations. Finally, an estimation based on a gravity regression has the advantage of using information of the economic mechanism that our theoretical model wants to stress, namely, spatial interactions arising from trade.

Denoting T_{ij} the bilateral exports from region i to region j,[3] Equation (18) in the Appendix and the iceberg trade costs can be used to show that:

[3] All regressions are at industry level, estimated for each year. Subscripts for industry and time are ommitted, except for RTA WTO variables, that can be time-varying.

$$T_{ij} = n_i p_{ij} q_{ij} = \underbrace{n_i p_i^{1-\sigma}}_{FX_i} \phi_{ij} \underbrace{\mu Y_j P_j^{\sigma-1}}_{FM_j} \tag{7}$$

The region-specific variables can be captured by exporter and importer fixed effects FX_i and FM_j, respectively. The phi-ness of trade ϕ_{ij} is defined by three groups of variables that enhance or deter trade :

1. Variables fixed in time such as bilateral distance[4] d_{ij}, contiguity C_{ij}, common language L_{ij}, past colonial ties Col_{ij}.
2. Two (time-varying) trade policy variables with dummies set to one when both partners have signed a Regional Trade Agreement RTA_{ij} or both partners are members of the World Trade Organization WTO_{ij}.
3. A national border effect dummy (B_{ij}) that will be explained in more detail below.

Our trade equation is finally specified as:

$$\ln T_{ij} = FX_i + FM_j + \delta \ln d_{ij} + \lambda_1 C_{ij} + \lambda_2 L_{ij} + \lambda_3 Col_{ij} + \lambda_4 RTA_{ij,t} + \lambda_5 WTO_{ij,t} + \lambda_6 B_{ij} + u_{ij} \tag{8}$$

And a ϕ_{ij} measure can be obtained as follows:

$$\hat{\phi}_{ij} = d_{ij}^{\hat{\delta}} \exp\left(\widehat{\lambda}_1 C_{ij} + \widehat{\lambda}_2 L_{ij} + \widehat{\lambda}_3 Col_{ij} + \widehat{\lambda}_4 RTA_{ij,t} + \widehat{\lambda}_5 WTO_{ij,t} + \widehat{\lambda}_6 B_{ij}\right) \tag{9}$$

A country's market potential is composed of two parts reflecting the market access to the national level (domestic market access, DMA), and to the international markets (Foreign market access, FMA):

$$DMA_i = \exp\left(\widehat{FM}_i\right) d_{ii}^{\hat{\delta}} \quad ; \quad d_{ii} = 2/3\sqrt{area_i/\pi} \tag{10}$$

$$FMA_i = \sum_{j \neq i}^{countries} \exp\left(\widehat{FM}_j\right) \hat{\phi}_{ij} \tag{11}$$

[4] We employ the great circle distance, which only requires latitudes and longitudes. Head and Mayer (2002) argue that using different methods to calculate the bilateral distance can affect the estimation of the other coefficients. They propose a measure that refines the great circle formula adding weights. It is refereed in the dataset as *distance-weighted* (*distw*). This variable uses the distribution of population inside each country. These authors also develop an alternative measure of *distw* that introduces an additional parameter to reflect a sensitivity of trade flows to great circle bilateral distance, which is often -1 in empirical estimations (More details in Head and Mayer, 2002). I also calculated market potential using these measures and it is available in the market potential dataset in CEPII website (See Section 3.3). I do not report these results in the paper, because they are quite similar to those found for simple great circle distances. I prefer the simplest method because latitudes and longitudes are available for all countries, which is not the case for internal distribution of the population.

I report results for two variations of the market access. The difference arise from the addition of the national border effect (B_{ij}).

The first method follows closely that of Redding and Venables (2004), and considers bilateral components in the trade costs, but no specific border effects (hence, B_{ij} is set to 0 for all observations). The advantage of this method is that only international bilateral trade is needed. Note that, although I am not using internal trade data, it is possible to estimate the national component, because it uses the own country's fixed effect and a measure of internal distance. Nevertheless, the absence of a measure of border effect may bias the coefficients of the ϕ_{ij} component. The market access built by this way will be referred in this paper as **RV method**.

The alternative proposed by Head and Mayer (2006) includes a border effect B_{ij}, set to 1 for international trade and 0 for internal trade. These additional observations (with respect to the RV specification) should proxy for trade with itself (T_{ii}). These authors propose an estimation corresponding to production minus total exports. The coefficient is expected negative for this variable, reflecting that additional costs are incurred when a product leaves the origin country. Although it is not always possible to have industrial production to compute T_{ii}, the dataset employed in this study is one of the most complete available (I explain the dataset in the sub-section 3.3). The market access built by this way will be referred in this paper as **HM method**.

We estimate eq. (8) using OLS and importer and exporter fixed effects, for each year and industry separately. Three comments are in order concerning the choice of the estimations. First, some researchers recommend non-linear estimations (e.g. Tobit, Poisson pseudo–maximum-likelihood) to deal with some specific problems of trade data.[5] Second, very recent works by Anderson and Yotov (2008) and Baier and Bergstrand (2008) are revisiting the multilateral resistance term and the method to estimate it. Third, Baier and Bergstrand (2007) argues that RTAs (and trade policy variables by extension) are endogenous, because of a selection bias. Unfortunately, they also argue that there are no satisfying methods to correct the bias in cross-section, and resort on panel data methods. As I am interested in obtaining year-specific coefficients, I am not able to use these techniques here. All in all, these authors show that cross-section suffers from a downward bias. Consequently, its impact on the market access and the simulations presented in this article can be seen as lower bounds.

While these are very important subjects, interesting extensions for future research, I consider them beyond of the scope of this paper. The main focus of this article is to provide several tests of the NEG wage equation, the subject of the next sub-section.

[5] OLS has been criticized because (1) the error term u_{ij} is a log-linearized version of the original error term (a problem that may entail a bias in the presence of heteroskedasticity) and (2) is not the ideal method to deal with zero values in trade flows. Nevertheless, this is a very complex and still unsolved issue in the literature (Silva and Tenreyro, 2006; Martinez-Zarzoso et al., 2007; Martin and Pham, 2008; Helpman et al., 2008), specially when the non-linear estimation is combined with country fixed effects (Buch et al., 2006).

3.2 Panel estimation of the NEG wage equation

Log-linearizing equation (6) gives us a direct relationship between MA and the regional wage, empirically testable:

$$\ln w_i = \zeta_1 + \hat{\sigma}^{-1} \ln MA_i + \zeta^{'} X_i + \nu_i \tag{12}$$

where w_i is the wage in region i. The superscript s is dropped because only information of the manufacturing sector is included in the analysis. The estimated coefficient for the MA correspond to an inverse of the measure of the elasticity of substitution in the underlying model. As many other cross-country variables can be correlated to market access, researchers usually introduce a number of controls (here represented by X_i): Human capital levels, proxies for institutional quality, geographical fundamentals and other NEG variables like Supplier Access, among others. The inclusion of a time dimension is highly desirable for at least three reasons.

First, country heterogeneity is explicitly taken into account, improving the control for alternative hypotheses. Starting from the first empirical work of this literature (Redding and Venables, 2004), the possibility of technology differences across countries affecting the residual in equation (12) is acknowledged. If panel data is available, the introduction of country (c_i) and year (D_t) fixed effects helps to mitigate this potential omitted bias, giving the following estimation:

$$\ln w_{i,t} = \eta_1 + \hat{\sigma}^{-1} \ln MA_{i,t} + \eta^{'} X_{i,t} + c_i + D_t + \epsilon_{i,t} \tag{13}$$

In some specifications, I will also include two time-varying controls, namely human capital levels and supplier access.

Second, the combination of industrial and time data allow for a richer analysis of the demand linkage, with a closer connection with the theory (the price and quantity versions aforementioned). The NEG wage equation is considered as a partial equilibrium. Nevertheless, if a reduction in trade costs is at work, a spatial reallocation should start. It is not possible to determine a priori the expected outcome, because it may depend on the stage of trade integration at the start of the period of analysis, and on industrial specificities like the elasticity of substitution (Head and Mayer, 2004b). Industry-specific estimations partially incorporates these specificities in the analysis. The time dimension can provide suggestive evidence concerning dispersion processes, associated to global integration, or the surge of new consumption centers, like in South-East Asia. As it will be shown in the section 4.2, some industries exhibit important spatial changes during the last decades, while other remained relatively unchanged. Moreover, following Head and Mayer (2006), the spatial evolution of the employment level can be considered to assess a quantity response to market access changes:

$$\ln L_{i,t} = \kappa + \kappa_1 \ln MA_{i,t} + c_i + D_t + \vartheta_{i,t} \tag{14}$$

Finally, it is possible to resort on dynamic panel data models to control for potential endogeneity and wage persistence. Indeed, a better focus on the dynamic of change is appealing because of countries' specificities of the labor markets. This problem was not addressed in the NEG wage equation literature, probably because most of the works focus on GDP per capita as dependent variable, and the impact of labor regulations is usually treated in models of intersectoral labor adjustment. More details on the GMM estimation are provided in the section 4.3.2.

3.3 Data

This article employs the new release of *TradeProd*, a cross-country dataset developed in CEPII, which integrates information on trade from COMTRADE and industrial production, manufacturing wages and employment levels from UNIDO and OECD-STAN. All these data is matched for 27 manufacturing sectors (ISIC 3-digit level) and covers the period 1980-2003. A detailed description of the original sources and procedures is available in Mayer et al. (2008) (See also Mayer and Zignago, 2005). Two features of the dataset deserve to be mentioned. First, information on trade is very complete, exploiting information on reports from importers and exporters. On the whole period, information for 222 countries/territories is included. The increase is particularly high for North-South trade (specially from Europe to the Developing world) and for intra-Asian trade (See Table 2 in Mayer et al., 2008 for the number of flows and volumes of trade between continents). A second important feature is that production levels and trade flows have been carefully matched at industrial level, which permits the construction of internal flows, i.e. production minus exports. By this way, an internal border can be estimated. Available Internal flows ranges (for all industries) from 1,145 in 2003 to 2,203 in 1993; and (for all years) from 1,011 (ISIC 372, Non-ferrous metal basic industries) to 2,186 (ISIC 311, Food products).

Dyadic information to estimate the gravity equation is taken from the *CEPII Distances database*. It comprises bilateral distances, dummies for common language and colonial links. Thierry Mayer kindly gave access to his dataset on trade policy variables (dummies on Regional Trade Agreements and WTO ascension), which is an extended version of Baier and Bergstrand (2007).

Manufacturing wages are also taken from *TradeProd*. Availability ranges (for all industries) from 1,144 in 2003 to 2,601 in 1984; and (for all years) from 1,353 (ISIC 372, Non-ferrous metal basic industries) to 2,240 (ISIC 311, Food products). Availability for employment levels is similar.

In the robustness section I employ information on cross-country human capital levels from Barro and Lee (2001). This widely used dataset reports levels of education attainment in periods of 5 years. I follow Hall and Jones (1999) in the allocation of education attainment levels proportions in the population for each country. An alternative dataset by Cohen and Soto (2007) is currently available, but it contains information by periods of 10-years, which entails a dramatic reduction for our sample.

The dataset with the market potential is made available in the CEPII website (www.cepii.fr).

4 Results

This section groups the results in three categories. First I describe the trade gravity equations and the measures of MA generated. Second, regressions for the impact of economic geography on wages are reported, as well as robustness checks. Finally, I perform some simulations to see the potential impact of trade policy changes on the world economic geography, and spatial inequality on wages.

4.1 Impact of Gravity equation methodologies in the Economic Geography variables

I present some summary statistics for the coefficients of the 1,296 (24 years * 27 industries * 2 methods) regressions of this first stage. Figure 2 summarizes the distributions of the distance coefficient. Panels a and b correspond to values from the RV and HM estimation, respectively. Each line corresponds to the distribution of coefficients for a specific year, and years are displayed in sequential order. Despite the strong heterogeneity across sectors, all values are found within the expected range (between -0.67 and -1.73). The impact of the distance is not reducing in time, which is in line with other studies (Mayer, 2008; Disdier and Head, 2008; Anderson and Yotov, 2008; Egger, 2008; Boulhol and de Serres, 2008).[6]

Figure 3 offers a closer look at the specific evolution of some industries. The numbers correspond to the industry codes (See Table 3 in the appendix). Points with a number correspond to the maximum and minimum for each year. For example, at the start of the period, the industry with the highest impact was *Other Non-metallic Mineral Products* (369), and that with a lower impact was *Pottery* (361). At the end of the period, maximum was for *Paper Products* (341) and minimum was for *Professional & Scientific Equipment* (385). During the period, the industry *Petroleum Refineries* (353) exhibits the highest values for most of the years. Two industries are usually found among the less affected by distance: *Pottery* (361) and *Tobacco* (314). Lines connect coefficients for some industries, and they suggest that the impact of the distance across industries follows a rather stable pattern, with some of them experiencing a rather slight increase (e.g., Industry 361, *Pottery*).

A low variation in the value of the coefficient could be a problem to identify the impact of the trade costs on wages through the market access, if only distance is introduced in the computation of the freeness of trade. Fortunately, other variables show more variation in time and across industries. Figure 4 replicates the same type of evolutions for the coefficients of the Regional Trade Agreements (RTA). This time no specific industries are predominant in the lowest or highest bounds (although *Iron and Steel* (371) appears in several years

[6] Several explanations have been proposed for this result, among others, the surge of capital/labor ratios (Egger, 2008) and substitutability of goods (Berthelon and Freund, 2008). Siliverstovs and Schumacher (2008) report falls in distance coefficients with industry-specific regressions, only for OECD countries.

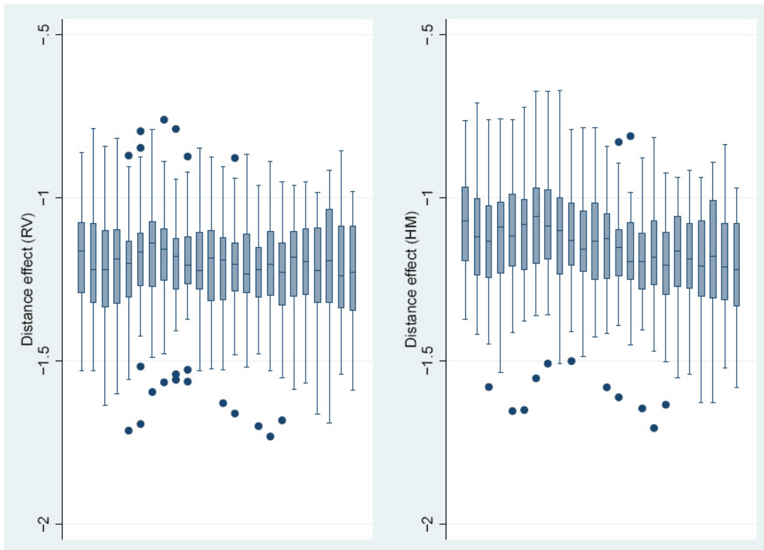

Figure 2: Distance effect (1980-2003).

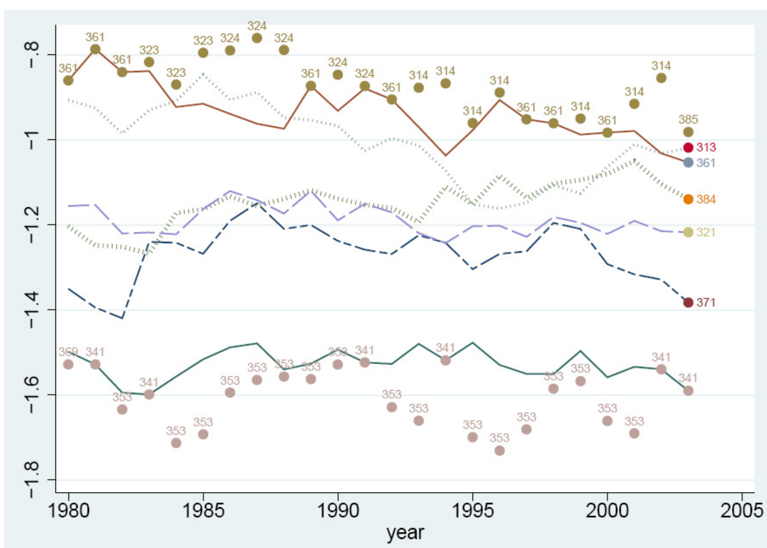

Figure 3: Distance effect for selected industries (RV estimation).

as the most impacted industry), and coefficients tend to became less dissimilar over time. In the lower bound, some coefficients are below zero for some industries, but at the end of the period all coefficients are positive. Looking at specific trends, much more variation is present for each industry. These results correspond to the RV method (Results for the HM method show also important variation across industries and time).

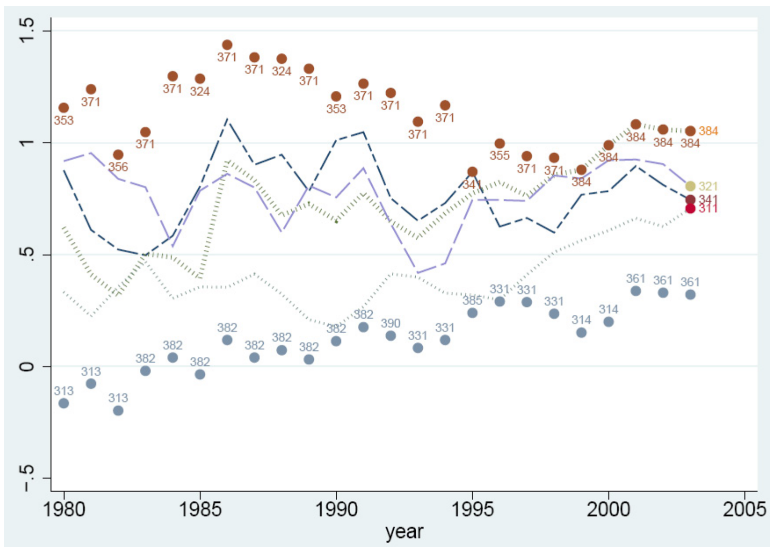

Figure 4: RTA effect for selected industries (RV estimation).

The combination of the variables used as proxies for trade costs provides estimations of freeness of trade specific to each pair of countries. A summarized measure of this impact is obtained by summing across importers. This is equivalent to a measure of market access, but discarding the demand and price index components, that could be more endogenous to wages (That is, $\sum_j^R \phi_{ij}$ instead of $\sum_j^R \frac{\mu Y_j}{P_j^{1-\sigma}} \phi_{ij}$). This variable will be used as instrument for market potential in section 4.3.2. Figure 5 summarizes the variation in time of each distribution of the (sum of) freeness of trade, as well as a comparison between the RV and HM methods. It is noteworthy that the distribution is highly skewed, suggesting a low level of integration across countries in relation to the maximum level. Also graphs do not exhibit an increasing trend over time, as once would expect due to trade globalization.

However, the graph should not be interpreted as freeness having a low variation in time and industries. When looking at specific industries (not shown here) important variations in the distributions can be found. Note also that extreme values are excluded in the graph to ease readability. A comparison between freeness for the RV and HM method shows important differences (as-

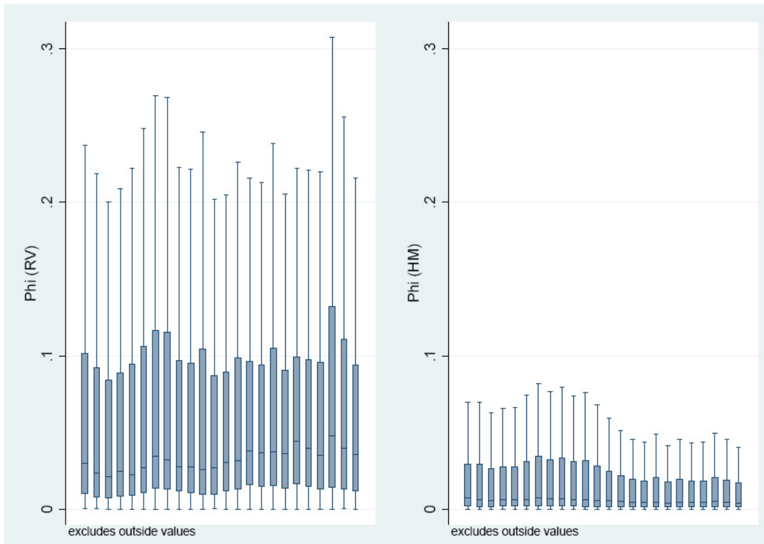

Figure 5: (Sum of) Phiness of trade (1980-2003).

sociated to the border effect, not measured in the RV method) and differences in the value of coefficients estimated.

4.2 Changes in World Economic Geography

Non-decreasing distance coefficients suggest that, despite the ongoing process of globalization, distance remains an important obstacle to trade. However, this is an average effect, and each country can display positive or negative evolution during the last decades, not only due to its own trade openness, but also due to the evolution of its main partners. Our variable of interest, the market potential, combines the freeness of trade with the market size from destination countries. It provides a way to compare each country's progress toward a more integrated world economic geography.

Figure 1, presented in the introduction, illustrates the rank evolution[7] of four specific industries. The darker (lighter) the colors, the more positive (negative) is the country's progress. Specifically, countries colored with tattletale gray correspond to those countries that experienced important backward movements in the ranking. Light gray (ash gray) is employed to highlight countries with slight deteriorations or no variation in the ranking. Dark gray indicates mod-

[7]Rank evolution is the change in gained or lost places in the market access hierarchy, relative to the United States. Values are normalized as deviations from the mean across countries, and they are grouped in 5 classes. The middle group is comprised between the mean +/− 0.5 standard deviation, and the next groups are delimited by 1 standard deviation. Blanks correspond to countries with no data.

erate positive changes and Black represent important progress in the ranking. Countries in white are missing values for the change in the ranking.

Panel (a) reveals that the ranking in the Tobacco industry has barely changed. This low dynamism can reflect a highly regulated sector (e.g. special taxes, restriction to advertising), and should hinder our identification strategy, based on the time dimension. Panel (b) corresponds to the ranking changes for the textile industry, usually seen as a low-tech industry. We distinguish advances for China, Vietnam, Mexico, India and Turkey, and strong downfalls for Argentina, Iran, and Angola, among others. Note also that a moderate progress is observed in the case of some peripheral European countries (Spain, Portugal, Poland, Romania, etc), reflecting the proximity advantage, rather than only low-wage competitiveness. Other countries escape to decline by virtue of their internal demand, like Brazil or USA. The fact that the main reason to relocate in this industry are the low-wage advantages and standardized technologies (Lu, 2007), can also reduce the power of the market access to explain wage evolutions. Although trade frictions are also influencing this outcome in this case (some reduction in tariffs and transport costs is necessary, in order to allow a separation of production and consumption locations), it is possible that spatial relocations are not correlated with wage evolutions. Panel (c) depicts the evolution for the Iron/Steel industry, considered for some studies as a Low to Medium-tech sector (Lall, 2000; Zhu, 2005). Notable advances can be traced for Canada, Spain, Vietnam, followed closely by India, USA, Turkey, among others. The figure suggests a spatial pattern of demand. Finally, in panel (d) the economic geography for the manufacturing of professional & scientific equipment is displayed. It is considered as a high-tech sector (Lall, 2000) and exhibiting a low product-cycle trade as measured by Zhu (2005). The figure suggests a concentrated spatial pattern, with Developed countries retaining their high ranks from the beginning of the period. However, an important number of Asian nations exhibit sizable progress.

Similar graphs can be generated using the RV method. In fact, correlation among both measures of market access[8] is high (0.74) for the whole sample. Among sectors, the lowest correlations are for *Footwear* (0.53), *Beverages* (0.55) and *Printing and Publishing* (0.55), while the highest are for *Professional & Science Equipments* (0.80) and *Non-ferrous Products* (0.83).

4.3 NEG Wage Equation at industrial level

4.3.1 Baseline regressions

Table 1 reports unconditional elasticities for total and foreign market access. Before entering in more detailed comments, three general aspects may be highlighted. First, only two industries do not exhibit any significant coefficient across all specifications: *Tobacco* and *Petroleum Refineries.* Considering only signifi-

[8]Correlation among HM methods using simple distance and using weighted distance (termed *distw* in the CEPII Distance dataset) is 0.93.

cant elasticities,[9] values ranges between 0.48 (*Leather products*, Market Access from RV method) and 0.12 (*Iron and Steel*, Foreign Market Access from RV method). Second, HM method seems to result in more precise estimates than RV method. Third, in the case of RV method, coefficients for Foreign market potential (columns 6 and 7) are often lower than those for total market access. Moreover, coefficients for Foreign Market Access and total Market Access are more similar in the case of HM method. In the following, I discuss results in more detail.

Although 25 out of 27 industries exhibit some evidence of wage response to market access, these supporting results are variable among sectors. In 9 cases, all coefficients provide evidence in favor of the NEG wage equation (qualified as *strong* in the 8th column). As an example, an increase of 10% of market access for *Manufacturing of Machinery Electric* (383) entails an increase in wages of 2-3%. 10 sectors display moderate evidence (termed as *Good* or *Good/Weak*). For example, coefficients for Beverages are always significant, but measures of market potential that discard internal demand are of lower magnitude or imprecisely estimated. Finally, evidence seems rather unfavorable for 6 industries because several of the coefficients are not significant. In industries from the Chemical sector (ISIC 35), the impact of market access is low or nonexistent. Finally, in the 5th column I present estimations from panel-dynamic GMM regressions. In 10 cases, regressions fail to find an effect of market access (More on GMM regressions in the next Sub-section). Note that several of the coefficients are significant only at more than 5% of significance.

Regarding methodologies, two aspects deserve special attention. First, for many industries, using the market access built with the RV method results in higher elasticities than using the HM method. Textiles are particularly sensible to the choice of market access: considering information on internal flows (HM method) prevents to reject the hypothesis of no effect of market access on wages in the case of Textiles. Second, foreign and total market access can make important differences in several industries (Textiles, Apparel, Leather, Paper, Printing, Iron/Steel, Machinery, products derived from Petroleum, Transport Equipment and Miscellaneous).

4.3.2 Robustness Checks

In these subsections I employ only the market access built using the HM method, unless otherwise indicated.

Endogeneity issues and industrial labor adjustment. Previous studies on market access mention the potential of endogeneity. The main criticism is the possibility of reverse causality: a shock in wages can have an impact on the market access. This concern is more acute when an aggregated MA is employed, which is the level of analysis for most of these works. By using an industrial-specific MA, exogenous impacts in wages in a specific industry should

[9] Threshold of significance is set at the 10% confidence level.

Table 1: **NEG Wage equations: Baseline regressions.**

INDUSTRY		Market Access			Foreign MA		Assessment	R^2		N
Code	Name	RV	HM	GMM	fRV	fHM		max	min	
311	Food	0.39^a	0.30^a	0.23^a	0.31^b	0.31^a	Strong	25	19	1982
313	Beverages	0.33^a	0.18^a	0.10^b	0.21^c	0.26^c	Good	25	23	1911
314	Tobacco	-0.04	0.04	0.07	-0.05	-0.01	No effect	31	31	1663
321	Textiles	0.15^c	0.16^b	0.09	0.13	0.17^c	Weak/No effect	19	17	1949
322	Apparel	0.19^b	0.22^a	-0.03	0.12^c	0.15^c	Weak	21	16	1831
323	Leather	0.48^a	0.20^a	0.18^b	0.42^a	0.38^a	Strong	18	16	1819
324	Footwear	0.32^a	0.22^a	0.11^c	0.24^c	0.27^b	Good/Weak	15	10	1708
331	Wood	0.40^a	0.26^a	0.11^c	0.32^a	0.35^a	Strong	23	17	1939
332	Furniture	0.32^a	0.25^a	0.32	0.33^a	0.39^a	Good	24	19	1691
341	Paper	0.17^c	0.24^a	0.18	0.21^b	0.27^a	Good/Weak	25	21	1974
342	Printing	0.46^a	0.30^a	0.14^c	0.40^a	0.44^a	Strong	26	22	1854
351	Ind. Chem.	0.18	0.28^a	-0.08	0.16	0.16	Weak/No effect	28	25	1787
352	Oth Chem.	0.22^b	0.31^a	0.02	0.21^c	0.29^b	Weak	29	24	1813
353	Petr. Ref.	0.09	0.05	0.13^c	0.07	0.05	No effect	16	15	1312
355	Rubber	0.11	0.28^a	0.26^c	0.22^b	0.28^a	Good	22	17	1813
356	Plastic	0.31^a	0.28^a	0.12^c	0.25^b	0.28^a	Strong	26	21	1762
361	Pottery	0.45^a	0.29^a	0.22^c	0.34^b	0.31^a	Strong	28	22	1495
362	Glass	0.35^a	0.36^a	0.15	0.36^a	0.35^a	Good	28	22	1706
369	Non-metal	0.11	0.23^a	-0.11	0.13	0.17^c	Weak	22	17	1793
371	Iron/steel	0.23^b	0.23^a	0.01	0.12^c	0.13^c	Weak/No effect	29	23	1592
372	Nf metals	0.39^a	0.34^a	0.38^a	0.28^b	0.26^c	Good	36	31	1241
381	Metal prod	0.27^b	0.28^a	0.21^c	0.33^a	0.37^a	Strong	25	19	1894
382	Machines	0.14	0.19^b	0.17^c	0.30^a	0.34^a	Good	21	19	1734
383	Mach elec	0.19^c	0.22^a	0.18^c	0.28^a	0.32^a	Strong	25	22	1759
384	Transport	0.12	0.19^a	0.23^a	0.17^b	0.20^a	Good	33	29	1749
385	Prof/Sci	0.26^b	0.37^a	0.33^b	0.26^b	0.28^b	Strong	33	29	1454
390	Misc	0.18	0.25^a	0.21^c	0.16^c	0.19^c	Good/Weak	22	18	1798

Columns 3 to 5 present coefficients for market access, columns 6 and 7 present coefficients for Foreign Market Access. All regressions in Col. 3, 4, 6 and 7 are Panel Fixed Effects (FE), including a constant and time dummies (not reported). Column 5 corresponds to two-step panel GMM (Arellano & Bond). GMM regressions are detailed in the Tables 5 and 6 in the Appendix. ^{a}, ^{b} and ^{c} represent respectively statistical significance at the 1%, 5% and 10% levels. Inference based on Robust Standard Errors, clustered by country (not reported in this table). For GMM estimator, standard errors were estimated by using the correction proposed by Windmeijer (2005). To ease reading and summary results, column 8 proposes a judgement concerning the evidence of the regressions. Columns 9 and 10 present respectively, the maximum and minimum (across all regressions, except GMM regressions) of within R squared. The last column shows the number of observations for the panel FE regressions. All estimations include time Fixed Effects and a constant (not reported).

have only minor implications on the market access for the same industry. Also the risk of omitted variable bias should be reduced by the panel FE estimation presented in the previous part. All this being said, it remains the possibility of time-varying unobservables correlated with the error term. Consequently, instrumentation is advisable. Exogenous instruments for the MA are scarce, even more when searching for instruments offering not only a country variation, but also variation by industry and time. A possible candidate is the sum of ϕ_{ij} across importers. That is, to compute a market potential that considers all trade costs measured in gravity equations, but discards the importer fixed effects, and hence, the income component. Also recall that ϕ_{ij} could be interpreted as an index of integration between both countries. Summing across destinations j, generates a proxy of the remoteness of a country i from the rest of the world. This measure has been used by Mayer (2008) to instrument market access in a panel of countries at aggregated level.

Endogeneity can also be associated to other aspects of the labor market, often neglected in the NEG literature, in particular the labor market adjustment and the long term response to market access. Workers should react to wage differentials across sectors inside of a country (job mobility), or across countries for the same industry (international migration), potentially dampening the total impact of the market access on wages. The second case is treated in the next section, and here I explore intranational job reallocation. I take advantage of the panel data dimension to explore the dynamic adjustments between wages and labor, and a two-step difference GMM estimator is chosen. It is important to mention that most empirical works on sectoral labor adjustment find a relatively sluggish employment response to wage evolutions (e.g., Artuc et al., 2007), or to trade liberalization (e.g., Wacziarg and Wallack, 2004). Several explanations have been proposed in the literature, often related to labor market conditions (e.g. search frictions or legal regulations like in Davidson et al., 1999 or Hasan et al., 2007), sectoral specificities (factor-specificity) or individual idiosyncrasy (Artuc et al., 2007). Finally, studies may fail to find employment adjustment because they usually do not have data on movements outside the industrial sector, specially toward the service sector (Hoekman et al., 2005) or simply because the adjustment happens within an industry, across firm differing in productivity (Bernard et al., 2003). This study will not escape to these caveats and alternative explanations. All this being said, this sectoral low response is consistent with industrial wages exhibiting some persistence. On the empirical side, researchers have treated this by introducing several lags of both variables to better capture this process, and implement GMM dynamic panel techniques. In particular, I follow studies in labor adjustment like Arellano and Bond (1991) (and more specifically to the case of trade liberalization impact, like Milner and Wright (1998) and Greenaway et al. (1999)), by introducing as regressors one and two lags[10] of wage and employment, and I implement a two-step GMM estimator applied to first-differenced data. I also treat the market access variable

[10] In one case (industry 332), the full specification of employment and wage lags results in rejection by the mentioned tests, but a version with only the lagged term for wages ($\ln w_{i,t-1}$) and the contemporaneous term for employment levels ($\ln L_{i,t}$) passes the tests.

as predetermined (i.e., it is introduced lagged of one year). Hence the variables considered are:

$$\ln w_{i,t} = \psi_1 + \psi_2 \ln MA_{i,t-1} + \psi^{'} \ln w_{i,t-\Theta} + \psi^{'} \ln L_{i,t-\ell} + c_i + \mu_{i,t} \qquad (15)$$

$$with \;\; \ell = \{0, 1, 2\} \;\; and \;\; \Theta = \{1, 2\} \, .$$

GMM implies first-differencing equation (15) to eliminate the country fixed effects c_i. This introduces correlation between the transformed error term ($\mu_{i,t} - \mu_{i,t-1}$) and the lagged, differenced dependent variable ($\ln w_{i,t-1} - \ln w_{i,t-2}$). Lagged values (starting from the second-lag) can be used as instrument, provided that the residual $\mu_{i,t}$ is not serially correlated.[11]

Tables 5 and 6 in the Appendix detail the results. In all regressions, the transformed error term exhibits first-order correlations, and no second-order correlations, as required for the validity of the instruments. Hansen and Sargan tests never reject the validity of instruments. In all cases but one (industry 341), instruments considered are at least third lags of the variables. As the panel has a rather long time dimension (in comparison to most of the panels using GMM), I follow recent literature on GMM (Calderon et al., 2002; Roodman, 2006; Beck and Levine, 2004) in collapsing the instruments to reduce the dimensionality and avoid over-fitting problems.[12]

As expected, the first lag for wages is always highly significant, confirming the persistence. Employment levels (lagged or contemporaneous terms) are significant in 9 industries only. As expected in an adjustment process, the first lags for employment are almost always of negative sign. Coefficients for market access are in general supportive of the results found in panel FE, although more imprecisely estimated and often of lower magnitudes. Among different significant coefficients, elasticities range between 10%-38% (beverages and Non-ferrous Metals, respectively). They are more in line of results found by Head and Mayer (2006) and Boulhol and de Serres (2008) at international level, and by Fally et al. (2008) and Hering and Poncet (2009) at intranational level.

Spatial adjustment. The performance of the wage equation gives some support to the idea that the international spatial adjustment is expressed in a price

[11] Additionally, the assumption of weak exogeneity must be valid, i.e., current explanatory variables may be affected by past and current realizations of the dependent variable, but not by its future innovations.

[12] Collapsed instruments refers to apply each moment condition to all available periods, instead of applying them to a particular time period, as usual. In the latter case, the number of moment conditions increases more than proportionally with the number of time periods. Also with the objective of reducing instruments, I report in Tables 5 and 6 the regression for each industry, that uses the lowest number of instruments, provided that the estimation pass the Sargan, Hansen and autocorrelation tests. Similar results (including tests for validity of instruments) are obtained when the entire number of possible lags is used and instruments are collapsed. Finally, similar coefficients are obtained in unreported regressions where instruments are not collapsed, but Sargan tests often rejected them, as expected in presence of "too many instruments".

version. This makes sense under the plausible hypothesis of factor immobility. Nonetheless, it is also possible that agglomeration economies affect the industry concentration (trough adjustment channels like migration and firm relocation). A way to explore this issue is considering if the market potential could explain also the employment distribution for the manufacturing industries (also in Panel FE method). For the sake of brevity, I will not show regressions here (they are available on request). Only three sectors exhibit a significant coefficient. These are among industries that exhibited important relocations in the recent decades: Apparel (322), Leather (323) and Footwear (324).[13] In sum, evidence in favor of a quantity response is not found by using labor as indicator.[14]

Wage equation with human capital controls. I perform the same baseline regressions, adding a control for human capital levels. The number of observations falls, ranging between 202 to 355 since data on education levels are only available over a 5-year period and for a restricted number of countries. To save space, only the coefficients of interest are discussed here. In the Appendix (See Table 4) I report detailed coefficients, significance levels and within R-squared for each regression, for HM and RV methods and distinguishing between total market access and the Foreign versions. The focus here will be only on regressions using the total market access, which are summarized for both the RV and HM method in the Figures 6 and 7. There, coefficients are plotted for each industrial regression. Each point indicates the magnitude of the coefficient for MA (Horizontal axis) and for human capital (vertical axis). Hollowed circles correspond to MA coefficients that are not significant at least at a 5% confidence level.

In the case of RV method (Figure 6) controlling for skill sorting has important consequences for the market access. In 8 sectors the elasticities for market access become non-significant at conventional levels (Tobacco, Textiles, Leather, Petroleum refineries, Transport Equipment and Professional & Scientific products). Moreover, it seems that substitutability among both variables is present: wages in industries like manufacturing of Professional & Scientific products are strongly affected by the education level, and market access seems not matter. By contrast, wages in sectors like Pottery, exhibit a very high sensibility to Market Access, and no significant influence from schooling. Despite the interesting variations of returns to schooling (and their plausible magnitudes in most of the cases), coefficients are very imprecisely estimated (as it is often the case in growth regressions). I attribute this in great part to the reduced number of observations, and maybe also to potential measurement error and missing cross-country differences in educational quality, the usual criticism for

[13] Their coefficients are, respectively, 0.27, 0.25 and 0.16.

[14] In the recent literature, other indicators of quantity adjustment such as firm relocation choice (Braconier et al., 2005; Head and Mayer, 2004a) and migration (Crozet, 2004; Hering and Paillacar, 2007) provide more favorable evidence on reactions of economic agents to differentials in market potentials. Nevertheless, a closer look at this studies reveals that this adjustment can act at a slow pace. Moreover, in the case of worker migration, other elements like selectivity can impede a reduction in wage differentials.

this variable. Finally, it is also possible that the impact of the schooling level may be specially captured in industry growth rather than wage differentials, as the study by Ciccone and Papaioannou (2008) suggests.

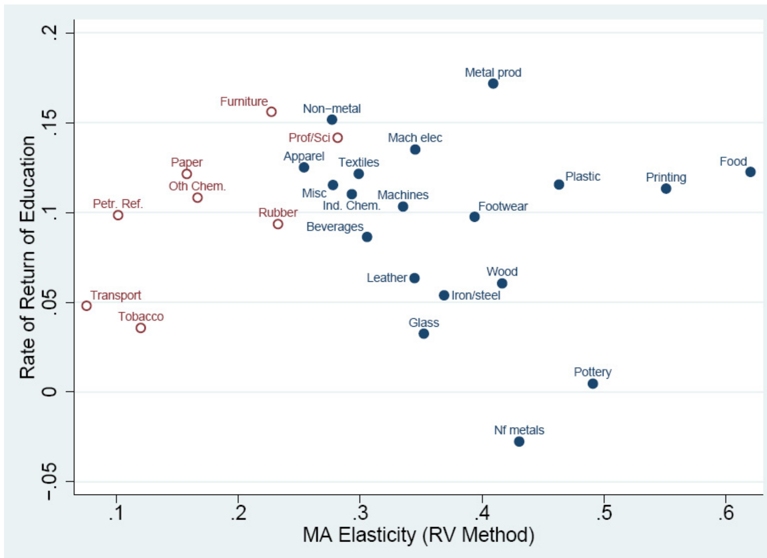

Figure 6: Market Access (RV) impact and skill sorting

Figure 7 suggests that HM method is much less affected by the skill sorting, and again the same 25 out of 27 industries identified in the baseline regressions exhibit a significant coefficient for the market access.

Supplier Access. The impact of trade on wages through NEG mechanism can also be linked to the so-called Supplier Access.[15] This reflects the locational advantage for a firm when many producers are proximate which could be reflected in lower costs. As expected, at national level, Supplier and Market Access should be highly correlated, making difficult to disentangle their effects. Industry level data could mitigate this problem. It is possible to build a measure of Supplier Access very similar to the market access, using the exporter fixed effect from aggregated gravity regressions (FX_i) or from industry-specific gravity regressions (FX_{ik}). Using an industry-specific supplier access is less appealing, because it is expected that other industries influence the cost function. Actually, regressions using this version of Supplier Access are never significant in panel FE (even if market access is not included as regressor). As a second robustness check, I built a second version of the supplier access that takes into account all manufacturing industries, that is generated by an aggregated gravity regres-

[15] I will only comment regressions of this subsection. All regressions are available on request.

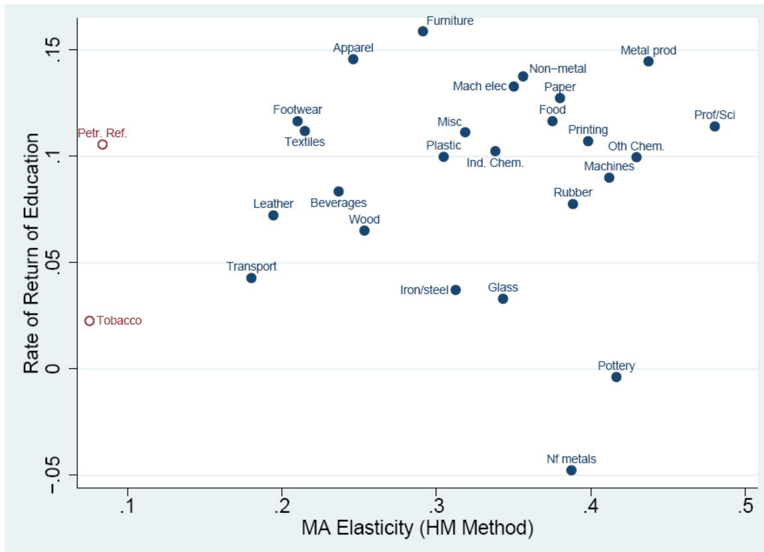

Figure 7: Market Access (HM) impact and skill sorting

sion like in Redding and Venables (2004).[16] These aggregated Supplier Access performs better in the case of some industries[17], provided that it is introduced as unique regressor (in Panel FE) to explain industrial-specific wages. Finally, all supplier access measures are never significant when industry-specific market access are included in the regressions.[18] In sum, Supplier Access measures are much less able to explain wages in our sample, in comparison to the market access.

Summary on robustness checks. Based on the evidence provided in the previous sections, two results can be established. First, although both measures of Market Access are highly correlated, HM method seems more robust. Second, focused in the HM estimations, 16 industries exhibit very robust results concerning the market access impact on wages. They are: Food (311), Bever-

[16]In this case, trade regressions using all manufacturing are performed, and the exporter fixed effects recovered are country-specific, but not industry-specific.

[17]Specifically, Textiles, Apparel, Leather, Wood products and furniture, Paper, Other chemicals, Plastic, Iron/Steel and Metal products. In all cases but one (Plastic), significance is only at 10%. I recall that these results correspond to an aggregated Supplier Access explaining industry-specific wages. This measure of Supplier Access performed much better when explaining aggregated wages, as previous studies have already found.

[18]I also explored a weighted Supplier Access, as in Fally et al. (2008), where all industry-specific exporter fixed effect FX_{ik} are considered in a composite indicator. Weights are the share of expense devoted to inputs, taken from an input-output table. I employed the USA matrix. Results did not improve, possibly because the USA matrix is not correctly representing technological levels for all countries

ages (313), Leather (323), Footwear (324), Wood (331), Printing (342), Rubber (355), Plastic (356), Pottery (361), Non-Ferrous metal products (372), all industries of manufacture of fabricated metal products, machinery and Equipment (38), and Miscellaneous (390). Figure 8 displays coefficients obtained by the GMM and panel method (respectively, columns 4 and 5 in the Table 1). Those in the right side correspond to robust coefficients. In the next section, some simulations for these industries are presented.

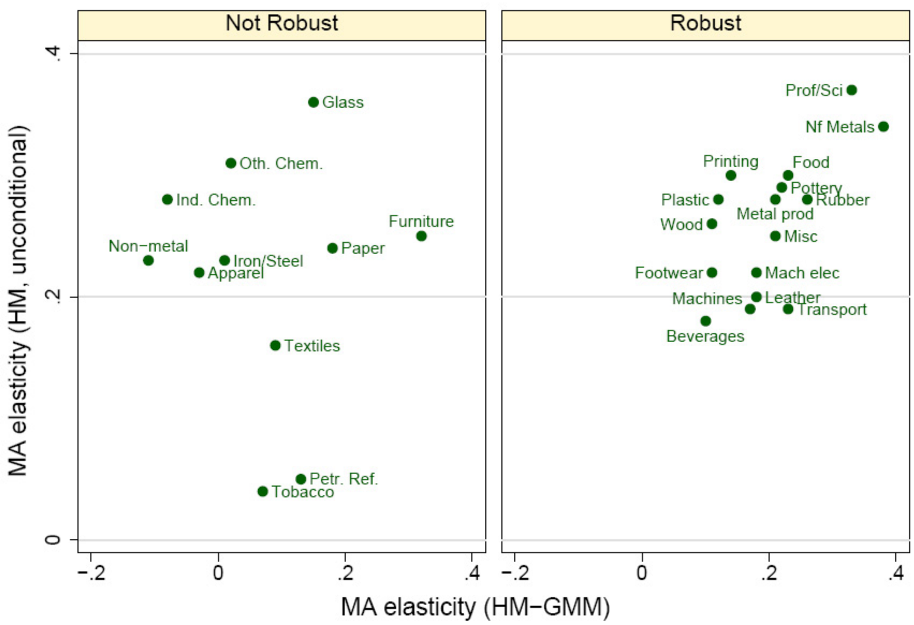

Figure 8: Market Access (HM) elasticities

4.4 How policy changes could affect the economic geography and wages

In this section I explore the potential impacts of some of the market access components on national wages.[19] I employ the same policy variables proposed by Mayer (2008), what allows for a comparison of country level impacts versus

[19]Simulations in New Economic Geography models have followed two paths. A group of studies are interested in the long-term consequences of reduction in trade costs on agglomeration patterns. These works emphasize migration or FDI as adjustment channels. Some examples are Forslid et al. (2002), Crozet (2004) and Hering and Paillacar (2007). The second line of research is interested on the spatial transmission of the shocks in the market access (or its components). These simulations focus on wages (or GDP per capita) at intranational (e.g. Hanson, 2005, and Mion, 2004) or international level (e.g. Mayer, 2008).

country-industry-specific impacts. The first variable is Regional Trade Agreements (RTA) status (a dummy set to 1 when partners have signed a RTA). RTA coefficient experienced an increasing evolution in time as figure 4 shows. The second variable is World Trade Organization (WTO) affiliation (a dummy set to 1 if both partners are members). Both characteristics affect the trade cost component of market access, reshaping the world economic geography, and hence the maximum wages that can be afforded to pay in each location. Like Mayer, impacts are evaluated for the year 2003 and using the MA built with the HM method.

One alternative is to calibrate the model, choosing plausible values for labor share in production β and for the elasticity of substitution among varieties σ. Mayer (2008) proposes $\beta = 0.2$ and $\sigma = 5$. Results for these simulations are available in columns 3, 4, 7 and 8 of Table 2. The columns 3 and 7 correspond to effects averaged over all concerned countries, and columns 6 and 8 report the maximum lost for each industry. A simple comparison confirms some of the Mayer's results: Figures are sizable, and losing benefits of WTO membership are more important in terms of wages than losing benefits of RTAs signed. Industrial data permit to evaluate which sectors appears more sensible. Average loses are the highest for the industries of manufacture of fabricated metal products, machinery & equipment (38) for both RTA and WTO status.

Table 2: **Impact of policy changes on wages (HM estimations).**

INDUSTRY		No RTA				No WTO			
		$\beta = .2; \sigma = 5$		HM		$\beta = .2; \sigma = 5$		HM	
Code	Name	Average	Max	Average	Max	Average	Max	Average	Max
311	Food	8.6	25.1	2.7	8.3	17.8	30.2	5.8	10.2
313	Beverages	5	34.1	1	7.2	27	60.7	6.2	15.3
323	Leather	9.1	27.5	1.9	6.2	46.3	54	11.7	14.3
324	Footwear	5	18.8	1.1	4.5	42.3	61.1	11.9	19
331	Wood	7.3	34.4	2	10.4	22.6	33.1	6.5	9.9
342	Printing	4.9	20.3	1.5	6.6	24.3	56.5	8.6	22.1
355	Rubber	9.4	24	2.7	7.3	43.3	61.7	14.8	23.3
356	Plastic	9.5	37.1	2.8	12	39.9	65.7	13.9	25.6
361	Pottery	3.4	11.3	1	3.4	39.4	65.2	13.9	26.3
372	Nf metals	9.9	22.7	3.5	8.3	31.4	38.5	11.9	15
381	Metal prod	9	28.6	2.7	9.1	30.8	48.3	10.1	17
382	Machines	15.1	39	3.2	9.1	43	51.3	10.4	13
383	Mach elec	14.7	38.3	3.5	10.2	56.7	66.3	17.2	21.5
384	Transport	16.9	52.7	3.6	13.4	38.7	52	9.1	13.1
385	Prof/Sci	11.3	26.3	4.3	10.6	50.3	60.2	22.8	28.8
390	Misc	9.7	22.4	2.6	6.3	48.2	58.2	15.5	19.9

Columns 3 and 4 present estimations of quantitative losses (in terms of wages) for all RTAs abandoned employing some parameters, while column 5 and 6 report estimations using the coefficients. Columns 7 and 8 present wage losses for all WTO membership abandoned employing some parameters, while column 9 and 10 report estimations using the coefficients.

One problem with this calibration approach is that parameters chosen suggest an elasticity of market access of 1, unrealistic given the results of this paper. I propose to take directly the coefficient from the Panel estimations from column 4 in table 1. The results are displayed in Table 2, in columns 5 and 6 for RTAs, and 9 and 10 for WTO membership. This time coefficients are much lower but still important for several industries. Among industries, and taking average values, losses can vary between 1% and 4.3% for RTAs, and between 5.8% and 22.8% for WTO affiliation.

The comparison of average and maximum values suggest that the distributions can be dominated for some specific countries suffering big losses. In Tables 7 to 10 in the Appendix I detail all the countries that exhibit more than 5% of losses due to RTAs abandon, and more than 10% due to WTO abandon. Countries are classified by continent to ease reading. Several comments can be made concerning the composition of the countries. First, the list is dominated by (1) smaller countries in terms of surface (Andorra) or GDP (Several African countries, Burma, Bhutan) and (2) geographically isolated nations like Caribbean and Pacific islands and landlocked countries (Bolivia, Paraguay, Central African Republic, Niger, Mongolia, Kyrgyzstan). Second, some Emerging/Developed countries like Canada, Ireland, Austria, Finland, Belgium, Tunisia, Algeria, Morocco and Taiwan, seems also highly affected by RTA and WTO withdrawals. A common feature among them is the strategic location, close to great demand centers (USA, Japan, European Union). Third, RTAs effect is sizeable specially for (peripheral) European countries, and often for more sophisticated products (Professional & Scientific Equipment, Transport Equipment, Machines). Finally, WTO is more associated to Emerging/Developing economies, specially African ones. For WTO results, there is no clear evidence of industrial specificities. This differentiated effect was already found by Mayer (2008) at aggregated level.

5 Conclusions

This study explored the impact of market access on the outcomes of New Economic Geography models. In particular, I assess the results of regressions where factor rewards (proxied by manufacturing wages) and quantity effects (proxied by manufacturing employment) are explained by the Market Access (MA). This variable is tested in two stages. First, MA estimations are built using a gravity equation of trade flows. 1,296 regressions were performed considering 27 industries, 24 years and 2 methods. The second step is a panel linear regression where MA is used as explanatory variable for wages and employment.

Results suggest a robust relationship for the wage equation for 16 out of 27 industries. The alternative of an adjustment of the market access by employment is explored, confirming that a good performance of the price effect (wage equation) is accompanied by a bad performance of a quantity effect (employment), specially in the international setting, where migration in expected to play a limited role in equalizing factor rewards. Also very weak results were found regarding the impact of Supplier Access, probably due to limitations to generate a good proxy for this variable at industrial level.

Although a robust coefficient was found, the impact of market access can strongly vary across countries. An important part of the spatial competitiveness changes very slow, and several peripheral countries will have to wait until new demand centers will arise, as it has been the case for Asia in the last quarter century. Other components, like the trade integration policies, can have important effects as it is shown in the last section. Regional Trade Agreements seem to influence manufacturing wages in (peripheral) European countries, and more often for more sophisticated products (Professional & Scientific Equipment, Transport Equipment, Machines). The impact of membership of World Trade Organization is more associated to Emerging/Developing economies, specially African ones, and there is no clear evidence of industrial specificities.

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6 Appendix.

The framework is a monopolistic competition with product differentiation, including firm-level increasing returns to scale and trade costs. The theoretical result shows that, under a zero profit condition, a positive relationship between market access and regional wages could be established, called "NEG wage equation": firms are willing to pay higher wages in regions that are close to large markets, since firms in these regions are able to deliver goods to markets at low transport costs.

Consider R countries and a two-sector economy. The first (A-sector) is characterized by constant returns, perfect competition and no trade costs. This sector offsets all trade imbalances in the other sector, thus permitting spatial specialization. The agglomeration forces take place in the second sector, usually termed M-sector. This sector produces the differentiated good, experiencing trade costs and increasing returns. Preferences are described by a Cobb-Douglas function with a Dixit-Stiglitz sub-utility for the M-good. A proportion μ of the regional income is devoted to consumption of the M-goods.

$$U_i = M_i^{\mu} A_i^{1-\mu} \quad ; \quad 0 < \mu < 1 \tag{16}$$

M_i is a consumption index of the varieties of the M-sector for region i. The varieties are defined as a *continuum* of N goods, where $q_{ji}(v)$ corresponds to the demand of region i for the vth variety coming from region j. As demonstrated by Baldwin et al. (2003), there is one firm per variety, so it is possible to refer indifferently to a variety or a firm, the total number of symmetric firms from a region being n_j. The parameter σ represents the constant elasticity of substitution (CES) between any two varieties.

$$M_i = \left[\sum_j^R \left(\int_0^{n_j} q_{ji}(v)^{\frac{\sigma-1}{\sigma}} dv\right)\right]^{\frac{\sigma}{\sigma-1}} = \left[\sum_j^R \left(n_j\, q_{ji}^{\frac{\sigma-1}{\sigma}}\right)\right]^{\frac{\sigma}{\sigma-1}} \quad ; \quad \sigma > 1 \tag{17}$$

As I am interested in the market access, MA, of region i, I maximize the profit of each firm to obtain the demand of region j for a variety coming from region i. This demand $q_{ij}(v)$ is determined by the regional income Y_j, the CIF price p_{ij} and a price index P_j. Trade costs between two regions i and j take the form of iceberg costs. With the FOB price (or mill price) being p_i, products from i are sold in region j for the price $p_{ij} = p_i \tau_{ij}$:

$$q_{ij} = \mu Y_j p_{ij}^{-\sigma} P_j^{\sigma-1} \tag{18}$$

$$P_j = \left[\sum_i^R n_i\ (p_i \tau_{ij})^{1-\sigma}\right]^{\frac{1}{1-\sigma}} \tag{19}$$

The price index, $P_j^{1-\sigma}$, is defined as the sum over the prices of individual varieties and reflects the potential suppliers of this market, considering trade costs, the elasticity of substitution, and the prices they charge. In this sense, it could be considered as a measure of the market crowding: a well served region is a region where I expect a high competition and therefore lower product prices.

Turning to the supply side of the model, increasing returns in the M-sector are usually modeled by a fixed cost per plant f_i, and a constant marginal cost m_i. Hence, profits of a firm are:

$$\pi = p_i q_i - m_i q_i - f_i \tag{20}$$

Profit maximization results in a constant mark-up:

$$p_i = \frac{m_i \sigma}{\sigma - 1} \tag{21}$$

Using the demand function in (3) and the fact that gross profits are given by $\pi_{ij} = p_{ij} q_{ij}/\sigma$, profits earned in each market j can be defined as:

$$\pi_i = \frac{1}{\sigma}\left[p_i^{1-\sigma}\left(\frac{\mu Y_j}{P_j^{1-\sigma}}\right)\phi_{ij}\right] - f_i \tag{22}$$

I adopted the notation of Baldwin et al. (2003) using the term *freeness* (a.k.a. *phiness*) of trade, $\phi_{ij} \equiv \tau_{ij}^{1-\sigma}$, that represents the combined impact of (1) trade costs and (2) the elasticity of substitution on demand. When these variables are too high, trade becomes prohibitive, and only the local demand is relevant ($\phi_{ij} = 0$). A frictionless world is represented by a $\phi_{ij} = 1$. To obtain the net profit in each potential location i, the sum of the profits from all locations j using equation (6) is made:

$$\Pi_i = \frac{1}{\sigma}\left[\left(\frac{\sigma}{\sigma - 1}\right)^{1-\sigma} m_i^{1-\sigma} \underbrace{\sum_j^R \left(\frac{\mu Y_j}{P_j^{1-\sigma}}\phi_{ij}\right)}_{MA_i}\right] - f_i \tag{23}$$

The term in the sum is called *Market Access* or *Real Market Potential*, and is usually abbreviated as MA, where MA_i is defined as the sum of the final demand addressed to region i, weighted by the accessibility from i to these markets j (since it considers ϕ_{ij}) and by the market crowding level of every region j (since it considers the price index $P_j^{1-\sigma}$).

The spatial equilibrium can be achieved under the hypothesis that all firms will earn the same profit. An iso-profit equation that normalizes the profit to zero gives us a relationship between costs and MA:

$$m_i^{\sigma-1} f_i = \frac{1}{\sigma}\left(\frac{\sigma}{\sigma - 1}\right)^{1-\sigma} MA_i \tag{24}$$

Table 3: **Names of industries.**

ISIC Code	Abbreviation	Industry description
311	Food	Food products
313	Beverages	Beverages
314	Tobacco	Tobacco
321	Textiles	Wearing apparel except footwear
322	Apparel	Wearing apparel
323	Leather	Leather products
324	Footwear	Footwear
331	Wood	Wood products except furniture
332	Furniture	Furniture except metal
341	Paper	Paper and products
342	Printing	Printing and publishing
351	Ind. Chem.	Industrial chemicals
352	Oth Chem.	Other chemicals
353	Petr. Ref.	Petroleum refineries
355	Rubber	Rubber products
356	Plastic	Plastic products
361	Pottery	Pottery, china and earthenware
362	Glass	Glass and products
369	Non-metal	Other non-metallic mineral products
371	Iron/steel	Iron and steel basic industries
372	Nf metals	Non-ferrous metal basic industries
381	Metal prod	Fabricated metal products
382	Machines	Machinery except electrical
383	Mach elec	Electrical machinery apparatus, appliances and supplies
384	Transport	Transport equipment
385	Prof/Sci	Professional and scientific, and measuring and controlling equipment, and photographic and optical goods
390	Misc	Other manufactured products

Industry 354 (Manufacture of miscellaneous products of petroleum and coal) is not included in the analysis.

Table 4: **NEG Wage equations: Conditional estimations.**

INDUSTRY		Coeffs. for		Coeff. for		Coeff. for		Coeff. for		R^2		N
Code	Name	RV	ρ	HM	ρ	FRV	ρ	FHM	ρ	max	min	
311	Food	0.62^a	0.12	0.38^a	0.12	0.56^a	0.12	0.56^a	0.12	36	30	360
313	Beverages	0.31^c	0.09	0.24^a	0.08	0.18	0.10	0.21	0.10	40	36	349
314	Tobacco	0.12	0.04	0.08	0.02	0.00	0.04	0.12	0.04	36	35	315
321	Textiles	0.30^c	0.12	0.21^b	0.11	0.31^c	0.12	0.34^b	0.12	30	28	359
322	Apparel	0.25^b	0.13	0.25^a	0.15^c	0.15	0.13	0.18^c	0.14	26	21	340
323	Leather	0.34^b	0.06	0.19^b	0.07	0.37^c	0.08	0.37^b	0.08	27	26	332
324	Footwear	0.39^b	0.10	0.21^b	0.12	0.30^c	0.11	0.30^c	0.11	27	23	319
331	Wood	0.42^a	0.06	0.25^a	0.07	0.39^b	0.05	0.44^b	0.05	29	25	359
332	Furniture	0.23	0.16	0.29^a	0.16^c	0.31^c	0.15	0.44^b	0.16	32	23	325
341	Paper	0.16	0.12	0.38^a	0.13	0.16	0.11	0.21^c	0.10	33	26	357
342	Printing	0.55^a	0.11	0.40^a	0.11	0.49^a	0.10	0.51^a	0.10	39	34	340
351	Ind. Chem.	0.29^c	0.11	0.34^a	0.10	0.38^c	0.09	0.36^c	0.10	41	37	338
352	Oth Chem.	0.17	0.11	0.43^a	0.10	0.20	0.10	0.25	0.10	39	32	333
353	Petr. Ref.	0.10	0.10	0.08	0.11	0.04	0.10	0.01	0.10	25	24	250
355	Rubber	0.23	0.09	0.39^a	0.08	0.33^c	0.09	0.38^b	0.08	26	20	342
356	Plastic	0.46^a	0.12	0.30^a	0.10	0.42^a	0.12	0.46^a	0.12	35	32	332
361	Pottery	0.49^a	0.00	0.42^a	-0.00	0.38^b	0.01	0.32^b	0.02	37	29	292
362	Glass	0.35^b	0.03	0.34^a	0.03	0.44^a	0.04	0.42^a	0.04	35	32	317
369	Non-metal	0.28^b	0.15^c	0.36^a	0.14^c	0.24^b	0.14	0.26^b	0.14	39	28	335
371	Iron/steel	0.37^b	0.05	0.31^a	0.04	0.26^c	0.06	0.27^c	0.06	36	29	306
372	Nf metals	0.43^a	-0.03	0.39^a	-0.05	0.34^b	0.01	0.32^c	0.02	47	40	248
381	Metal prod	0.41^a	0.17^c	0.44^a	0.14^c	0.43^a	0.15^c	0.47^a	0.15^c	38	29	344
382	Machines	0.34^c	0.10	0.41^a	0.09	0.54^a	0.08	0.55^a	0.08	29	23	325
383	Mach elec	0.35^b	0.14	0.35^a	0.13^c	0.36^b	0.12	0.38^b	0.12	37	32	328
384	Transport	0.08	0.05	0.18^b	0.04	0.16^c	0.05	0.18^c	0.05	38	34	326
385	Prof/Sci	0.28	0.14	0.48^a	0.11	0.29	0.14	0.31^c	0.14	43	37	279
390	Misc	0.28^c	0.12	0.32^a	0.11	0.24	0.11	0.28^c	0.11	31	26	336

Columns 3 and 6 present coefficients for market access, columns 7 to 9 present coefficients for Foreign Market Access. Columns 4, 6, 8 and 10 report coefficients for the human capital. ^{a}, ^{b} and ^{c} represent respectively statistical significance at the 1%, 5% and 10% levels. Inference based on Robust Standard Errors, clustered by country (not reported in this table). Columns 11 and 12 present respectively, the maximum and minimum (across all regressions) of within R squared. The last column shows the number of observations. All estimations include time and country Fixed Effects, and a constant (not reported).

Table 5: NEG Wage Equation (GMM). Ind 311-353

	(311)	(313)	(314)	(321)	(322)	(323)	(324)	(331)	(332)	(341)	(342)	(351)	(352)	(353)
$Ln(w_{t-1})$	0.73^a	0.66^a	0.96^a	0.73^a	1.14^a	0.42^b	0.55^b	0.52^a	0.72^b	1.12^a	1.13^a	0.70^a	0.85^a	0.67^a
	(0.15)	(0.13)	(0.20)	(0.14)	(0.24)	(0.14)	(0.17)	(0.16)	(0.25)	(0.16)	(0.25)	(0.13)	(0.25)	(0.12)
$Ln(w_{t-2})$	–0.12	–0.04	0.07	–0.04	–0.19	0.15	0.05	–0.00		–0.24	–0.30	0.07	–0.02	–0.11
	(0.12)	(0.10)	(0.28)	(0.13)	(0.30)	(0.11)	(0.15)	(0.12)		(0.15)	(0.18)	(0.11)	(0.19)	(0.12)
$Ln(L)$	-0.35^c	–0.28	–0.44	–0.18	0.10	-0.22^c	–0.16	-0.34^a	0.19^c	–0.17	–0.06	–0.19	–0.84	–0.50
	(0.17)	(0.14)	(0.56)	(0.16)	(0.28)	(0.09)	(0.20)	(0.10)	(0.09)	(0.11)	(0.36)	(0.13)	(0.55)	(0.26)
$Ln(L_{t-1})$	0.25	0.36^c	0.50	0.23	–0.09	0.06	0.16	0.16		0.21^c	0.34	0.14	0.74	0.34
	(0.19)	(0.18)	(0.52)	(0.14)	(0.23)	(0.06)	(0.19)	(0.10)		(0.10)	(0.43)	(0.15)	(0.50)	(0.23)
$Ln(MA_{t-1})$	0.23^a	0.10^b	0.10	0.09	–0.03	0.18^b	0.11^c	0.11^c	0.32	0.18	0.12	–0.08	0.02	0.13^c
	(0.06)	(0.04)	(0.17)	(0.05)	(0.19)	(0.07)	(0.05)	(0.05)	(0.25)	(0.09)	(0.11)	(0.11)	(0.09)	(0.05)
No. of obs	1475	1423	1208	1460	1370	1358	1269	1453	1379	1478	1363	1307	1259	908
No. of groups	121	115	108	118	112	112	106	119	111	118	114	115	91	89
Hansen(p)	0.60	0.31	0.54	0.57	0.73	0.46	0.49	0.76	0.24	0.96	0.50	0.36	0.64	0.97
Sargan(p)	0.65	0.13	0.49	0.71	0.91	0.12	0.32	0.96	0.22	0.98	0.67	0.27	0.47	0.49
AR(1)p	0.00	0.00	0.07	0.01	0.00	0.03	0.02	0.01	0.00	0.00	0.01	0.02	0.04	0.00
AR(2)p	0.24	0.59	0.35	0.30	0.96	0.30	0.54	0.89	0.31	0.15	0.44	0.17	0.46	0.83
No. instr.	61	86	32	81	36	106	66	76	26	49	42	77	47	116
Lags instr.	3-10	3-15	7-8	3-14	3-5	3-19	3-11	3-13	10	2-7	5-8	4-14	11-15	3-22

Table 6: NEG Wage Equation (GMM). Ind 355-390

	(355)	(356)	(361)	(362)	(369)	(371)	(372)	(381)	(382)	(383)	(384)	(385)	(390)
$Ln(w_{t-1})$	0.66^a	0.59^a	0.59^a	0.50^b	1.40^a	0.71^a	0.50^a	0.56^a	0.70^a	0.98^a	0.65^a	0.58^b	0.47^a
	(0.13)	(0.15)	(0.15)	(0.17)	(0.25)	(0.16)	(0.12)	(0.14)	(0.16)	(0.15)	(0.16)	(0.20)	(0.12)
$Ln(w_{t-2})$	0.16	0.04	–0.23	0.06	–0.62	0.07	-0.25^c	–0.07	0.10	–0.29	0.05	0.03	0.06
	(0.13)	(0.13)	(0.12)	(0.07)	(0.33)	(0.13)	(0.11)	(0.13)	(0.17)	(0.15)	(0.16)	(0.15)	(0.09)
$Ln(L)$	–0.06	0.02	0.19	–0.14	–0.07	0.32	–0.16	–0.28	–0.12	–0.19	–0.45	0.18	-0.31^b
	(0.14)	(0.14)	(0.11)	(0.14)	(0.53)	(0.22)	(0.08)	(0.17)	(0.20)	(0.14)	(0.24)	(0.11)	(0.11)
$Ln(L_{t-1})$	–0.00	–0.01	–0.13	–0.14	0.13	–0.15	0.26^c	0.37^c	0.20	0.17	0.42	–0.18	0.18
	(0.11)	(0.15)	(0.12)	(0.12)	(0.28)	(0.18)	(0.12)	(0.16)	(0.19)	(0.12)	(0.25)	(0.11)	(0.09)
$Ln(MA_{t-1})$	0.26^c	0.12^c	0.22^c	0.15	–0.11	0.01	0.38^a	0.21^c	0.17^c	0.18^c	0.23^a	0.33^b	0.21^c
	(0.13)	(0.05)	(0.10)	(0.14)	(0.29)	(0.10)	(0.11)	(0.10)	(0.08)	(0.08)	(0.06)	(0.13)	(0.10)
No. of obs	1361	1326	1077	1281	1325	1174	909	1405	1318	1315	1314	1103	1336
No. of groups	106	105	100	105	111	101	76	116	106	109	105	87	113
Hansen(p)	0.68	0.24	0.82	0.57	0.75	0.63	0.74	0.23	0.29	0.25	0.58	0.61	0.30
Sargan(p)	0.73	0.18	0.94	0.15	0.54	0.99	0.18	0.20	0.51	0.63	0.35	0.76	0.20
AR(1)p	0.01	0.03	0.00	0.01	0.00	0.01	0.01	0.00	0.03	0.00	0.01	0.04	0.01
AR(2)p	0.22	0.12	0.17	0.25	0.40	0.36	0.26	0.41	0.31	0.86	0.21	0.57	0.19
No. instr.	102	99	46	102	31	67	83	71	77	71	57	70	92
Lags instr.	4-19	3-18	3-7	5-20	3-4	6-14	7-19	3-12	4-14	3-12	4-10	7-16	5-18

Robust Standard Errors in parentheses. ^{a}, ^{b} and ^{c} represent respectively statistical significance at the 1%, 5% and 10% levels.

Table 7: **Greatest impacts of policy changes on wages.**

Industry	Continent	RTA	WTO
Food	Africa	Chad, Algeria Central African Rep.	Congo (Dem. Rep.)
	America		Montserrat
	Asia		Taiwan
	Europe	Andorra, Slovakia	
	Pacific	Pitcairn, Christmas I.	
Beverages	Africa		Congo (Dem. Rep.)
	America		Cayman I., British Virgin I., Montserrat, Anguilla
	Asia		East Timor, Taiwan
	Europe	Andorra	Andorra
	Pacific		Northern Mariana I., Tokelau, Cook I., Norfolk I., Micronesia, Wallis and Futuna, Cocos (Keeling) I., Christmas I., Niue
Leather	Africa		Central African Rep., Congo (Dem. Rep.), Algeria, Niger, Burundi, Libya, Mali, B. Faso, Egypt, Cameroon, Gabon, Congo, Mozambique, Morocco, Mauritania, Sudan
	America		British Virgin I., Cayman I., Turks and Caicos I., Montserrat, Anguilla, Bolivia
	Asia		Taiwan, East Timor, Mongolia, Burma
	Europe	Albania	Albania
	Pacific		Norfolk I., Christmas I., Tokelau, Cocos (Keeling) I., Marshall I., Niue, Cook I., Wallis and Futuna, Pitcairn, Micronesia, Northern Mariana I., Papua New Guinea
Footwear	Africa		Chad, Niger, Congo (Dem. Rep.), Tunisia, Morocco, Algeria
	America		Anguilla, Cayman I., Turks and Caicos I., Montserrat, British Virgin I.
	Asia		Taiwan, East Timor, Burma
	Europe		Andorra
	Pacific		Palau, Christmas I., Northern Mariana I., Norfolk I., Micronesia, Tokelau, Cook I., Wallis and Futuna, Cocos (Keeling) I., Marshall I., Niue
Wood	America	Cayman I.	

Columns 3 displays countries with a lost (in terms of wages) higher than 5% for RTAs abandoned, while column 4 displays countries with wage losses higher than 10% for WTO membership abandoned.

Table 8: **Greatest impacts of policy changes on wages. (Cont.)**

Industry	Continent	RTA	WTO
Printing	Africa		Congo (Dem. Rep.), Niger
	America	Anguilla	Cayman I., Montserrat, Anguilla, Turks and Caicos I.
	Asia		Taiwan, East Timor
	Europe		Andorra
	Pacific		Christmas I., Tokelau, Cook I., Niue, Norfolk I., Wallis and Futuna, Cocos (Keeling) I., Northern Mariana I., Marshall I., Micronesia
Rubber	Africa	Niger, Algeria, Zimbabwe	Congo (Dem. Rep.), Niger, Central A. Rep., Chad, Zimbabwe, Guinea-Bissau, Somalia, Mauritania, Zambia, Benin, Algeria, Guinea, Sierra Leone, Burundi, Togo
	America		Montserrat, Anguilla, Cayman I., British Virgin I., Greenland, Bolivia, Turks and Caicos I.,
	Asia		Guyana, Taiwan, East Timor, Mongolia, Laos, Burma, Bhutan
	Europe	Ireland, Andorra	Andorra, Moldova, Rep.of
	Pacific		Christmas I., Pitcairn, Micronesia, Marshall I., Cocos (Keeling) I., Wallis and Futuna, Niue, Cook I., Tokelau, Northern Mariana I., Norfolk I., Papua New Guinea, Solomon I.
Plastic	Africa	Niger	Congo, Niger, Central African Rep., Chad, Zimbabwe
	America	Montserrat, Cayman I., Anguilla	Montserrat, Turks and Caicos I., British Virgin I., Anguilla, Cayman I., Greenland
	Asia	Kyrgyzstan	Taiwan, East Timor, Laos, Mongolia
	Europe	Andorra	Andorra
	Pacific	Micronesia	Micronesia, Christmas I., Cook I., Northern Mariana I., Cocos (Keeling) I., Tokelau, Norfolk I., Marshall I., Niue, Wallis and Futuna, Pitcairn
Pottery	Africa		Central African Rep., Niger, Congo, Guinea-Bissau, Chad, Mali, Zimbabwe, Tunisia, Algeria, Morocco, Cameroon
	America		Turks and Caicos I., Montserrat, Cayman I., Anguilla, British Virgin I., Greenland
	Asia		East Timor, Taiwan, Burma, Mongolia
	Europe		Andorra
	Pacific		Pitcairn, Micronesia, Christmas I., Niue, Tokelau, Norfolk I., Palau, Wallis and Futuna, Cook I., Marshall I., Northern Mariana I., Papua New Guinea

Columns 3 displays countries with a lost (in terms of wages) higher than 5% for RTAs abandoned, while column 4 displays countries with wage losses higher than 10% for WTO membership abandoned.

Table 9: **Greatest impacts of policy changes on wages. (Cont.)**

Industry	Continent	RTA	WTO
Nf metals	Africa	Guinea, Uganda, Mali, Malawi, Tunisia, Sierra Leone	Congo (Dem. Rep.), Mali, Niger, Malawi, Congo, Guinea, Chad, Benin, Somalia, Central Afr. Rep., Uganda, Libya, Tunisia, Zambia, Angola, Rwanda, Algeria, Cameroon, Sudan
	America America	Nicaragua	British Virgin I., Turks and Caicos I., Greenland, Anguilla, Canada, Bolivia, Nicaragua, Cayman I., Paraguay, Suriname
	Asia		East Timor, Mongolia, Afghanistan, Cambodia, Georgia
	Europe	Ireland	Albania, Andorra
	Pacific		Micronesia, Cook I., Tokelau, Cocos (Keeling) I., Marshall I., Solomon I., Christmas I., Norfolk I., Wallis and Futuna, Papua New Guinea, Vanuatu, Niue
Metal prod	Africa	Western Sahara	Western Sahara, Congo, Central African Rep., Niger, Chad
	America	Montserrat, Paraguay	Cayman I., Turks and Caicos I., Anguilla, Greenland, Montserrat
	Asia	Jordan	East Timor, Burma, Taiwan
	Europe	Andorra, Switzerland	Andorra
	Pacific		Christmas I., Tokelau, Niue, Pitcairn, Cook I., Micronesia, Marshall I., Cocos (Keeling) I., Wallis and Futuna, Northern Mariana I., Norfolk I.
Machines	Africa	Tunisia, Guinea-Bissau, Mali	Western Sahara, Benin, Guinea-Bissau, Central African Rep., Chad, Zambia, Somalia, Niger
	America America	Turks and Caicos I., Belize	British Virgin I., Cayman I., Montserrat, Anguilla, Turks and Caicos I., Canada, Greenland, Belize, St. Pierre and Miquelon
	Asia		East Timor, Taiwan
	Europe	Belgium, Luxembourg, Ireland	
	Pacific Pacific		Christmas I., Northern Mariana I., Micronesia, Niue, Norfolk I., Cocos (Keeling) I., Marshall I., Solomon I., Pitcairn
Mach elec	Africa	Gabon, Guinea, Central Afr. Rep.	Congo (Dem. Rep.), Western Sahara, Guinea-Bissau, Zimbabwe, Chad, Somalia, Guinea, Benin, Zambia, Togo, Sierra Leone, B. Faso, Morocco, Gabon, Algeria, Central African Rep., Tunisia
	America	Montserrat, Greenland	Montserrat, Cayman I., British Virgin I., Anguilla, Greenland, Guyana, Canada, Belize, Falkland I., Suriname, Bolivia, Paraguay
	Asia		East Timor, Taiwan, Burma, Laos, Bhutan, Mongolia
	Europe	Andorra, Austria	Andorra, Albania
	Pacific	Christmas I.	Micronesia, Christmas I., Niue, Pitcairn, Norfolk I., Cook I., Cocos (Keeling) I., Tokelau, Wallis and Futuna, Solomon I., Marshall I., Palau, Papua New Guinea

Columns 3 displays countries with a lost (in terms of wages) higher than 5% for RTAs abandoned, while column 4 displays countries with wage losses higher than 10% for WTO membership abandoned.

Table 10: **Greatest impacts of policy changes on wages. (Cont.)**

Industry	Continent	RTA	WTO
Transport	Africa	Tunisia	Congo (Dem. Rep.)
	America	British Virgin I., Greenland	British Virgin I., Turks and Caicos I., Anguilla, Cayman I., Montserrat, Greenland
	Asia		Taiwan, East Timor
	Europe	Slovakia, Austria, Switzerland	Andorra
	Pacific	Pitcairn	Micronesia, Norfolk I., Pitcairn, Cook I., Tokelau, Wallis and Futuna, Christmas I., Niue, Cocos (Keeling) I.
Prof/Sci	Africa	Niger, Zambia, Benin, Liberia, B. Faso	Congo (Dem. Rep.), Zambia, Congo, Benin, Guinea, Mali, Guinea-Bissau, Chad, Niger, Cameroon, B. Faso, Liberia, Mauritania, Gabon, Senegal, Cte d'Ivoire, Somalia, Burundi
	America	Guyana, Greenland	Montserrat, Turks and Caicos I., Cayman I., Greenland, Belize, Anguilla, Canada, Haiti, St. Pierre and Miquelon, Falkland I.
	Asia		Taiwan, East Timor, Bhutan, Burma, Afghanistan
	Europe	Slovakia, Albania, Finland, Ireland	Andorra, Albania, Macedonia (FYR)
	Pacific	Micronesia	Micronesia, Northern Mariana I., Norfolk I., Pitcairn, Christmas I., Marshall I.,Cocos (Keeling) I., Niue, Cook I., Wallis and Futuna, Papua New Guinea, Solomon I., Palau, Vanuatu
Misc	Africa	Algeria, Niger	Niger, Congo (Dem. Rep.), Central Afr. Rep., Congo, Mali, Zambia, Somalia, Chad, Cameroon, Algeria, Burundi, Zimbabwe, Mauritania, Togo, Guinea-Bissau, Guinea, B. Faso, Libya, Uganda
	America		Turks and Caicos I., Anguilla, Cayman I., British Virgin I., Greenland, Montserrat, Canada, Guyana, Bolivia
	Asia		East Timor, Laos, Taiwan, Mongolia, Burma, Bhutan
	Europe	Albania	Andorra, Albania, Macedonia (FYR)
	Pacific		Cook I., Micronesia, Norfolk I., Christmas I., Cocos (Keeling) I., Pitcairn, Niue, Marshall I., Wallis and Futuna, Papua New Guinea, Tokelau, Palau, Northern Mariana I.

Columns 3 displays countries with a lost (in terms of wages) higher than 5% for RTAs abandoned, while column 4 displays countries with wage losses higher than 10% for WTO membership abandoned.