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Import Competition and Employment Dynamics

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Abstract

This paper develops a new way to quantify the effects of import competition on intra-industry patterns of job creation and destruction. It is based on an industrial evolution model with imperfectly competitive product markets, heterogeneous firms, and endogenous entry and exit. First, Colombian panel data on metal product producers are used to identify the model's parameters, including the sunk start-up costs faced by new firms, the stochastic process that governs firms' idiosyncratic productivity shocks, and the hiring and firing costs associated with changing employment levels. Then several counterfactual trade policy experiments are conducted. In addition to quantifying the effects of openness on job turnover patterns, the model delivers predictions on the associated changes in labor productivity, the nature of the transition process when openness changes, and the role of hiring and firing costs in shaping firms' responses.

1 Introduction

This paper characterizes the effects of import competition on intra-industry job flows. To do so, it develops an industrial evolution model with monopolistically competitive product markets, heterogeneous firms, stochastic wages and import prices, start-up costs for new firms, and asymmetric hiring and firing costs. As the processes that drive real wages and import prices unfold, and as individual firms realize their productivity shocks, the set of active producers and their employment levels respond. Each agent behaves optimally, given her beliefs about the exogenous processes and the behavior of her competitors. In equilibrium, each agent's beliefs are consistent with the actual behavior of all others.

Unlike earlier studies that use industrial evolution models to characterize job flows (e.g., Hopenhayn and Rogerson, 1993), the model developed in this paper is estimated econometrically. Doing so is not straightforward because some industry-wide variables that affect firms' profits –average prices and the number of producers– evolve endogenously in response to the decisions of incumbent producers and new entrants. To overcome this problem I solve for an approximate equilibrium in which these industry-wide variables follow a Markov process that is consistent with individual behavior. This approach is motivated by the recent literature on models with heterogeneous agents in which distributions are approximated by their finite moments (Krusell and Smith, 1998).

Applied to the Colombian metal products industry, the estimates of the key parameters are very plausible. First, sunk entry costs amount to about 13 per cent of the average total sales. These are the costs that are associated with starting-up a business, such as government imposed legal expenses, installation and customization costs, and product development. Second, per-period fixed costs are estimated to be about 7 per cent of the average value of total sales in the industry. Finally, hiring costs amount to about 3 months wages, and firing costs to about 4.5 months wages. The latter numbers are particularly encouraging since, during the sample period, Colombian law mandated severance payments amounting to one month's wage per year worked based on a salary at the time of separation.

The preliminary simulation results based on these parameters show, among other things, that switching to a more liberal trade regime is associated with a significant reduction in the number of jobs in the short-run. This is consistent with the findings of previous econometric studies (e.g. Freeman and Katz 1991). A substantial fraction of the total reduction in jobs is due to net exit. Thus the model provides a structural explanation for the stylized fact that significant job destruction takes place on the entry/exit margin, and it suggests that studies based on panels of continuing firms are likely to miss a fundamental type of job flow. There are also productivity gains associated with the switch to a more liberal regime because of the cleansing effect of exit.

More precisely, labor productivity increases by 5.6 percent on average. This, too, is consistent with econometric studies that show productivity gains in the aftermath of a trade liberalization due to the exit of inefficient plants (e.g., Pacvnik, 2002).

Contrary to the short-run predictions of the model, in the long-run, there is no permanent job gain associated with the protective regime. The reason is that, in addition to higher output prices under protective regime, wages are higher too. Further, there is more volatility in the tariff-adjusted exchange rate, so the job turnover rates are actually higher.

2 Literature Review

Many studies have investigated the link between increasing foreign competition and domestic labor market. Some describe patterns of association using industry-level data. For example, Kletzer (1998, 2000) regresses industry-specific worker displacement rates on import-penetration rates and concludes that employment declines with the increase in import competition. Similar conclusions emerge from Freeman and Katz (1991), Revenga (1992), and Sachs and Shatz (1994), who use industry level regressions to relate import competition to employment. Davidson and Matusz (2003) regress job creation and destruction data on sector-specific foreign trade indices. Finally, focusing on production rather than jobs, Bernard et al (2005) documents patterns of correlation between import penetration rates and industry-specific rates of plant survival and growth.

Other empirical studies analyze the effect of exchange rate fluctuations and tariff reductions on the net employment fluctuations and gross job flows in firm-level econometric studies. Klein, Triest and Schuh (2003) analyze the impact of the real exchange rate movements on gross job flows using establishment level panel data. They find that changes in the trend of the real exchange rate affect reallocation but not net employment. Gourinchas (1999) uses firm level data, and finds that exchange rate appreciation reduces net employment growth as a result of lower job creation and increased job destruction. On the other hand, Bentivogli and Pagano (1999) find a limited effect of exchange rate fluctuations on job flows for a number of European countries.

Another literature is essentially theoretical. Davidson, Martin and Matusz (1999) investigate the implications of labor market turnover on international trade patterns in a general equilibrium model of trade where jobs are created and destroyed at exogenous rates. They consider two symmetric countries in terms of endowment and production technology. Then the labor turnover becomes an independent determinant of comparative advantage and determines the trade pattern between the two countries. Artuc, Chaudhuri and McLaren (2003) develop a dynamic trade model where workers are subject to moving costs. Their simulation results show that the mobility costs slows down the process of moving from one steady state to another. Kambaurov (2003) analyzes the effect of firing taxes in intersectoral labor mobility in a general equilibrium competitive search model. His model, when calibrated to Chilean economy, shows that firing costs have limited effects on productivity, output and welfare, but they increase employment and decrease intersectoral reallocation of labor.

Finally, without looking explicitly at trade issues, some analysts have developed structural models that describe the dynamics of job creation and destruction in the presence of adjustment costs. This literature is particularly relevant because it deals with uncertainty, and in some cases, firm heterogeneity. Bentolila and Bertola (1990) develop a partial equilibrium labor demand model of a monopolist which faces a stochastic demand function and asymmetric hiring and firing costs. They find that firing costs do not have large effect on hiring decisions, and that high firing cost do not reduce the average level of employment. Hopenhayn and Rogerson (1993) develop a general equilibrium model with endogenous entry and exit, competitive product markets and no aggregate uncertainty. In contrast to Bentolila and Bertola (1990), they find that severance costs equal to one year's wages decrease average employment levels by about 2.5 percent. Veracierto (2001) introduces a flexible form of capital into Hopenhayn and Rogerson's framework and studies the short-run affects of the severance cost. He finds that incorporating capital does not affect the long-run consequences of severance payment but it creates differences in the short-run depending on the elasticity of substitution between the two inputs. Finally, Cooper, Haltiwanger and Willis (2004), in an effort to reconcile the different characteristics of aggregate and plant-level data, estimate the general functional form of adjustment cost which consists of fixed cost, disruption cost and the quadratic cost using plant-level data. Although the authors specify a general form of adjustment cost, they consider the decision of an infinitely lived firm, and abstract from interaction among firms as well as the entry and exit decisions.

In this paper, I adopt an industrial evolution approach to analyze the patterns of job creation and destruction in response to heightened import-competition. This allows me to incorporate entry and exit decision of firms, which account for a large portion of job flows in the industry I study. It also allows me to study role of the expectations in shaping firms' decisions and to perform counterfactual experiments. Finally, unlike the existing industrial evolution models that focus on job flows, I allow for imperfect competition and estimate the model parameters econometrically.

3 The Model Overview

Assume that agents are infinitely lived and make their choices in discrete time. Each period, the economy consists of a number of monopolistically competitive heterogenous domestic producers and a number of potential entrants. Each firm is assumed to produce a uniquely differentiated variety and faces a downward sloping demand function. The demand function depends on the firm's own price, the average price in the industry, and the number of varieties currently produced.[1]

The demand function for each firm is derived from the quasi-linear preferences of a representative consumer,who values varieties regardless of whether they are domestically produced or imported. As a result, the demand schedule for domestic producers depends on the number and prices of imported varieties since these affect the total number of varieties and the average price. It is assumed that prices as well as the number of imported varieties move stochastically over time. Domestic producers take these stochastic processes as given.

At each point in time, an incumbent firm's operating profits depend on several firm-specific variables: its current productivity level, its current employment, and its previous period employment. The latter variable matters because the firm faces hiring and firing costs. Each firm's profits also depend on two endogenous market-wide variables: average output prices for domestically-produced varieties and the number of domestic producers. Finally current profits depend upon three exogenous market-wide variables: wages, the number of foreign varieties in the market, and the average price of imported varieties, which in turn depends upon commercial policy and the exchange rate.

Note that it is not necessary to know the joint distribution of firms in order to calculate a firm's current profits; knowing average prices and the number of market participants is sufficient. Nonetheless, it is necessary to keep track of this distribution because the transition density for average prices and numbers of participants depends upon the number of firms in each individual state.

In addition to incumbents, the model also describes the behavior of potential entrants. These firms are identical up to the entry costs that they draw. Once they observe these costs, they compare them with the expected value of being an incumbent next period. When the expected value of being an incumbent is higher than the entry cost, they decide to enter the industry. Following the entry decision, entrants draw their initial productivity realization from a commonly

[1] This is monopolistic competition in the Chamberlin sense where firms consider themselves too small to affect the industry aggregates.

known distribution, and start to produce the next period.

For any period, the sequence of actions is as follows. First, before the realization of firm-specific and aggregate shocks, last period's incumbents who decided to exit pay their labor adjustment cost and exit.[2] Then, both incumbents and potential entrants observe the current realization of aggregate shocks. Given the aggregate state of the economy and their individual states, incumbent firms make their employment decisions. Finally, potential entrants decide whether to enter or stay out for the next period. Those that enter draw their productivity and join to the next period's incumbents.

Given this setting, different firms have different reactions to common industry-wide shocks. One reason is that different firms face different demand elasticities and have different probabilities of exit. The response of firms facing higher demand elasticities will be more sensitive to the shocks. Due to policy distortions (e.g. hiring and firing costs) industry-wide response will also differ across positive and negative shocks. It will be more costly for larger firms to contract or to exit in response to negative shocks, similarly it will be more costly for small firms to expand.

It is important to note at this stage that the evolution of the firm distribution is not trivial in this economy. At any point in time, the economy will be populated by incumbents that differ in their current productivity shocks and past employment. Given aggregate variables and aggregate shocks, each producer will decide on its current employment and its entry/exit decision for the next period. These decisions together with the entry of new firms will determine the distribution of incumbents next periods. Hence, although an individual firm is only concerned about the evolution of industry aggregates, the way these aggregates evolve reflects individual decisions.

Methodologically, this paper is in the spirit of Krusell and Smith (1998), who find that a Markov process for the mean of the wealth distribution is enough to approximate the equilibrium in a stochastic growth model with heterogeneous households.[3] I compute the equilibrium by assuming that agents forecast the evolution of the aggregates using a technique similar to Krusell and Smith's (1998).

3.1 Production

Each firm has access to the same production technology, up to a firm-specific productivity shock. The firms' only input is labor. Firm i's production technology is given by

[2] There is no scrap value.

[3] Similarly Khan and Thomas (2003) in their paper which analyzes the role of nonconvex adjustment cost in aggregate investment dynamics in a stochastic general equilibrium model finds it is enough to approximate the equilibrium close enough using only the two moments of the distribution of plants over capital and productivity.

$$f(l) = e^{\mu_{it}} l_{it}^{\theta}, \quad 0 < \theta \leq 1, \tag{1}$$

where l_{it} denotes labor input, and μ_{it} is the firm-specific productivity shock. The firm-specific shock is assumed to follow a first order $AR(1)$ process given by

$$\mu_{it} = a_0 + a_1 \mu_{it-1} + \varepsilon_{\mu}, \qquad \varepsilon_{\mu} \sim N(0, \sigma_{\mu}^2). \tag{2}$$

The transition density for the firm specific productivity is denoted by $M(\mu_{it+1}|\mu_{it})$.

In each period t, firms pay w_t for each unit of labor that they employ. It is assumed that there is an elastic supply of labor and firms behave as price takers in the factor market. In addition to the unit cost of labor, firms incur a hiring cost, c_h, per new employee, and a firing cost, c_f, per dismissed employee. Firms also pay a fixed per period cost f.

3.2 Demand

The demand side of the product market is characterized by the quasi-linear preferences of a representative consumer over horizontally differentiated varieties q_i, $(i \in \{1, ..N\})$, and a numeraire good, q_o. The utility function of a representative consumer is given by

$$U(q_o, q_1, q_2, .., q_N) = q_o + \alpha \sum_{i=1}^{N} q_i - \frac{1}{2}\gamma \sum_{i=1}^{N} q_i^2 - \frac{1}{2}\eta (\sum_{i=1}^{N} q_i)^2. \tag{3}$$

This utility function has been previously used by Ottaviano, Tabuchi, Thisse (2002) and Melitz and Ottaviano (2004). As opposed to CES type of utility functions it allows the price elasticity of demand to vary with respect to average price and the number of differentiated goods. The parameters α, γ, and η are all positive. Parameters α and η index the degree of substitution between the varieties and the outside goods, while γ indexes the degree of product differentiation among the varieties.

Utility maximization and aggregation over L consumers, gives the demand for each variety q_i as,

$$q_i = (\frac{L\alpha}{\eta N + \gamma} - \frac{L}{\gamma} p_i + \frac{\eta N}{\eta N + \gamma} \frac{L}{\gamma} \overline{P}). \tag{4}$$

where $\overline{P}$ is the average price of all differentiated varieties.

The number of varieties produced domestically is denoted by N_D, and the number of imported varieties is denoted by N_F, i.e. $N = N_D + N_F$. Hence

$$\overline{P} = \frac{N_D \overline{P}_D + N_F \overline{P}_F}{N_D + N_F}, \tag{5}$$

where $\overline{P}_D$ denotes the average price among the domestic varieties and $\overline{P}_F$ denotes the average price of imported varieties.

3.3 Aggregate States

Three aggregate shocks that appear in this model are real wages, w_t, the average price of imported varieties, $\overline{P}_{F,t}$, and the number of imported varieties, $N_{F,t}$. The number of imported varieties are assumed to be fixed up to an error term,[4]

$$N_{F,t} = \overline{N}_F + \varepsilon_t, \quad \varepsilon_t \sim N(0, \sigma_\varepsilon^2). \tag{6}$$

The average price of imported varieties, $\overline{P}_{F,t}$ and the wages, w_t, are summarized by a vector $s_t = (\overline{P}_{F,t}, w_t)$, and they jointly evolve according to a first order Markov Process. The associated transition density is denoted by $\Phi\left(s_{t+1}|s_t\right)$. It is assumed that, s_t is independent of ε_t. Finally, let Γ_t be time-t distribution of incumbents over their idiosyncratic productivity shocks and last period's employment levels.

3.4 Incumbents' Decision Problem

The current state of an incumbent firm is given by its current productivity shock μ_{it}, its last period's employment l_{it-1}, aggregate shocks s_t and Γ_t. Incumbents' problem is to choose the price and the associated level of employment imposed by the technology and the exit decision for the next period. Let $\Gamma_{t+1} = H(\Gamma_t, s_t)$ be a transition function that maps current distribution and aggregate shocks to tomorrow's distribution. The function H reflects firm-level decisions and will be correctly understood by all agents in equilibrium. Given m, Φ, and H each incumbent has a well-defined problem characterized by the following Bellman equation,

$$\begin{aligned} V(\mu_{it}, l_{it-1}; \Gamma_t, s_t) &= Max_{l_{it}} P_i(\Gamma_t, l_{it}, \mu_{it}) e^{\mu_{it}} l_{it}^\theta - w_t l_{it} - c(l_{it}, l_{it-1}) - f \\ &\quad + \beta Max(EV(\mu_{it+1}, l_{it}; \Gamma_{t+1}, s_{t+1}|\mu_{it}, s_t), -c(0, l_{it})) \end{aligned} \tag{7}$$

subject to

$$\Gamma_{t+1} = H(\Gamma_t, s_t),$$

and

$$c(l_{it}, l_{it-1}) = Max\{c_h(l_{it} - l_{it-1}), c_f(l_{it-1} - l_{it})\}.$$

Here $P_i(\Gamma_t, l_{it}, \mu_{it})$ denotes the inverse demand function that a firm faces as it is determined by equation (4). I make use of the fact that firm's output, q_i, will be a function of μ_{it}, l_{it}, and Γ_t.

[4] Notice that, although the number of foreign varieties is taken fixed up to an error term, the domestic consumers will consume more of imported varieties as the average price of imported varieties decreases and the import penetration ratio which is defined as the total value of import divided by the total value of domestic consumption will respond to the heightened import competition in the price margin.

This optimization problem will generate two policy functions, one for employment,

$$l_{it} = e(\mu_{it}, l_{it-1}; \Gamma_t, s_t) \tag{8}$$

and one for the exit decision

$$\chi(\mu_{it}, l_{it-1}; \Gamma_t, s_t) = \begin{cases} 0 & if \quad EV > -c(0, l_{it}) \\ 1 & otherwise \end{cases} \tag{9}$$

For a given $(\Gamma_t, s_t, l_{it-1})$, the exit decision χ will give a cut-off level of productivity $\mu_{it} = \mu^*$ below which the firm will choose the exit.

3.5 Potential Entrants' Decision Problem

Each period, there is an exogenous pool of $\overline{R}$ ex-ante identical potential entrants. Entrants pay their sunk entry cost, F, before entering the market. At the beginning of each period, each potential entrant draws its entry cost from a commonly known distribution, denoted by $\Psi(F)$ with positive support on $[F_L, F_H]$.

Upon drawing an entry cost, each potential entrant decides whether to enter the market next period and pay the entry cost. Once the entry decision is made, entrants draw their productivity from a commonly known distribution denoted by $M_0(\mu)$. Potential entrants make their entry decisions given the current market states, given the transition density for the initial productivity draws. Given an incumbent's problem defined in (7), each potential entrant's problem is given by

$$V^E(\Gamma_t, s_t | M_0) = EV(\mu_{i,t+1}, 0; \Gamma_{t+1}, s_{t+1}) \tag{10}$$

subject to

$$\Gamma_{t+1} = H(\Gamma_t, s_t)$$

It is assumed here that potential entrants enter with the level of employment which maximizes their expected value.

Potential entrants will choose to enter if

$$V^E(\Gamma_t, s_t | M_0) > F. \tag{11}$$

Condition (11) determines the number of entrants, denoted by

$$E_t = \Psi(V_t^E)\overline{R}. \tag{12}$$

3.6 Equilibrium

Given M, M_0, Φ, Ψ, and H an equilibrium is a value function V for incumbents, a value function V^E for potential entrants, and a set of decision rules $e(.)$ and $\chi(.)$ such that

1. Given M, Φ, and H each incumbent solves (7) and the resulting decision rules are given by $e(.)$ and $\chi(.)$.
2. Given V and H, V^E characterizes the problem of potential entrants.
3. H is consistent with firm's optimal decision rules.

4 The Methodology to Solve the Equilibrium:

The endogenous state variable of this economy, Γ_t, is a high-dimensional object. To overcome the problem of dimensionality, I use the fact that an individual firm is concerned only with s_t and with two industry aggregates, the number of producers N_t, and the average price $\overline{P}_t$. Let $m_t = \begin{bmatrix} \overline{P}_t & N_t \end{bmatrix}$ denote these industry aggregates, and let $\widetilde{H}$ be a Markov chain on m_t. Then, we can define the following dynamic programming problem for an incumbent:

$$V(\mu_{it}, l_{it-1}; m_t, s_t) = Max_{l_{it}} P_i(m_t, l_{it}, \mu_{it}) e^{\mu_{it}} l_{it}^{\theta} - w_t l_{it} - c(l_{it}, l_{it-1}) - f$$
$$+ \beta Max(EV(\mu_{it+1}, l_{it}; m_{t+1}, s_{t+1} | \mu_{it}, s_t), -c(0, l_{it}))$$

subject to

$$m_{t+1} = \widetilde{H}(m_t, s_t),$$

and

$$c(l_{it}, l_{it-1}) = Max\{c_h(l_{it} - l_{it-1}), c_f(l_{it-1} - l_{it})\}.$$

We can redefine the potential entrants' problem in a similar fashion.

In this alternative formulation, agents only use the information provided in $\widetilde{H}$. Although an individual firm is only concerned with s_t and m_t and how these evolve over time, at any point in time the economy is characterized by a distribution of incumbents over their firm-specific productivity shocks and the last period's employment levels.

Given Γ_t and $\widetilde{H}$, there are two aggregations in this approximate economy. First, given s_t, m_t and $\widetilde{H}$, firms' decisions determine an average price level for the current period. Let $g(\Gamma_t, \widetilde{H}, m_t, s_t)$ denote the mapping from firm decisions to endogenous industry aggregates. The function g contains the information on spot market clearing that determines the average price level. In equilibrium we need the following fixed point condition $m_t = g(\Gamma_t, \widetilde{H}, m_t, s_t)$, $\forall t$. Second, given m_t, s_t

and $\widetilde{H}$, there is a map from Γ_t to Γ_{t+1}. Let $\Gamma_{t+1} = f(\Gamma_t, m_t, \widetilde{H}, s_t)$ denote this map. Hence, in equilibrium $\widetilde{H}$ must be consistent with f.

The approximate equilibrium is solved using the following algorithm:

1. Choose number of grid points for $\overline{P}_t$ and N_t.

2. Guess $\widetilde{H}$ as a Markov process on $\overline{P}_t$ and N_t.

3. Given $\widetilde{H}$, solve the incumbents' and potential entrants' optimization problems.

4. Use the resulting decision rules, simulate the industry over a long period, and generate the time series for the evolution of $\overline{P}_t$ and N_t. In order to simulate the economy, start with an initial Γ_0 and m_0. Using the optimal decisions update Γ_t for $t > 0$. Furthermore, at each period t check if $m_t = g(\Gamma_t, m_t, \widetilde{H}, s_t)$ is satisfied, i.e. $\overline{P}_t$ is determined by spot market clearing.

5. Use the stationary region of the time series to update the transition density, $\widetilde{H}$. This is achieved by calculating the number of times the economy moves from $(\overline{P}_i, N_j)$ to $(\overline{P}_k, N_k)$ over a long period, and using this information to determine the relevant entries of $\widetilde{H}$.

6. Check if the updated and old $\widetilde{H}$ are sufficiently close, if not return to step 3.

5 The Colombian Metal Products Industry and Its Environment

I estimate the model using data from Colombian structural metal product industry (SIC 3813) for the period 1977 through 1991. The choice of this particular country is motivated by data availability, and by the fact that Colombia is a small open developing country that has experienced significant swings in its foreign trade and exchange rate policies. Accordingly, it provides a natural candidate to study the firm-level consequences of trade related shocks. In this section, I describe the Colombian structural metal product industry and the macroeconomic environment surrounding this industry.

At the beginning of the sample period, Colombia had a fairly liberal trade environment. In 1980, the average nominal tariff on manufacturing goods was about 26 per cent, and almost 70 per cent of all commodities did not require import licensing.[5] However, the economy became more protectionist after it suffered a severe economic crisis in the early 80s. In 1984, 83 per cent of all commodities required licences, and imports of some products were prohibited. The evolution

[5] For a more detailed discussion of the trade environment of the country, see Fajnzylber and Maloney (2000).

of the nominal tariff rates and import prices for this industry is given in Figures 1 and 2. The 1983-1985 period can be easily recognized in these figures. During the sample period, i.e. from 1977-1991, the average nominal tariff for the 4-digit metal products industry was about 30 per cent. Average nominal tariff rates fell to 19 per cent with the trade reforms in 1991.

The Colombian labor market was considered rigid during the sample period. Employers were mandated to pay severance payments which amounted to one month salary per year worked based on the salary at the time of separation. Workers had the rights to advance payments of the amount they would potentially receive in case of a job break, with the restriction that the advance payments be used for eduction or housing. In case of a job break the advanced amounts were subtracted from the severance payment in nominal, not real, terms. In the case of a voluntary quit, employers still were required to pay seniority premium. Colombia reformed its labor codes in 1990. After 1990, the fixed cost of firing were replaced with a monthly contribution to a capitalised fund, which would be accessible to the worker only in the case of separation. Moreover, the 1990 reform widened the legal definition of 'just cause' dismissals to include economic conditions.[6]

The metal products industry is an import-competing industry consisting mainly of small scale firms.[7] On average there are about 160 plants during the sample years, producing a range of metal products such as metal door handles, window frames, bolts, metal curtain walls, etc. These products are mainly used in construction. The assumption of horizontal differentiation is especially suitable for the metal fabrications used in architectural design, such as metal curtain walls or door handles. Although more structural metal fabrications such as metal sheets and bolts have similar standards, locational differences between the plants provide one dimension of differentiation.[8]

On average, the plant turnover rate was about 23 percent per annum, and new entrants accounted for about 15 percent of the total output. High entry and exit rates suggest low barriers to entry, and thus support my assumption of monopolistic competition. The industry also exhibits very significant import penetration rates during the sample period. Table 2 reports the ratio of the total value of imports to total domestic consumption, i.e. $\frac{M}{Q-X+M}$, where Q, X, and M denote the value of domestic production, the value of exports and the value of imports, respectively. Notice

[6] See Kugler (2005) and Heckman and Pages (2000) for more details on the labor market regulations in Colombia.

[7] The average number of employees was 36 during the sample years.

[8] Product description of the industry 3813: "Manufacture of structural components, steel or other metal, of bridges, tanks, smoke stacks and buildings; metal doors and screens, window frames and sashes, metal staircases and other architectural metal work; metal sections for ships and barges; boiler shop products; and sheet metal components of buildings, stovepipes and light tanks. The assembly and installation at the site of pre-fabricated components into bridges, tanks, boilers, central air conditioning and other sheet-metal systems by the manufacturer of these components which can not be separately reported, is to be included in this group, along with the main manufacturing activity."

Quoted from United Nations Statistic division, http://unstats.un.org.

that in contrast, the export-orientation rate $\left(\frac{X}{Q-X+M}\right)$ is quite low which allows me to ignore the export decision of firms in the model.

In order to be able to talk about job flows in the sample data, I need to introduce some notation. Let L_t be the total employment in the industry at period t. Let E_{t-1} and E_t be the total number of employees in all expanding incumbent plants for the period $t-1$ to t, and similarly, let C_t and C_{t-1} be the total number of employees in all contracting plants. Finally, let B_t be the total number of employees in all entrants at period t, and let D_t be the number of employees in all exiting plants. Then the net employment growth, $(\frac{\Delta L_t}{L_{t-1}})$, can be decomposed into four parts,

$$\frac{\Delta L_t}{L_{t-1}} = \left(\frac{E_t - E_{t-1}}{L_{t-1}} + \frac{B_t}{L_{t-1}}\right) - \left(\frac{C_{t-1} - C_t}{L_{t-1}} + \frac{D_{t-1}}{L_{t-1}}\right),$$

where the first bracketed term is job creation rate, and the second bracketed term is job destruction rate. Job creation has two sources: job creation that comes from expanding plants $(E_t - E_{t-1})$,and that comes from entrants (B_t). Similarly, job destruction has two sources: from contracting plants, $(C_{t-1} - C_t)$ and from exiting plants, (D_{t-1}). The summation of these four components is called the gross job flow. Table 4 shows evolution of these four components in the data and Table 5 shows the gross and net flows. The first thing to notice is that both net and gross employment flows fluctuate significantly. Gross job flows are also very large, averaging about 48 percent during the sample period. Furthermore, gross job flows from entry and exit dominate those from expansion and contraction in all but one sample year. So the data confirm that gross job flows are predominantly determined by the entry and exit of plants, therefore it is preferable to build a model based on entry and exit decisions of firms. In the crisis year of, 1983, there is a significant decline in the net employment, and most of the job destruction occurs on the exit margin. Following two years when the level of protection increased, we see net employment growth. Most of the action again comes from the entry margin.

6 Estimation

The model descibed above involves two types of parameters—those that can be identified with macro data alone, and those that must be estimated with plant-level panel data. My estimation thus involves two stages. First, I estimate a regime-switching VAR process for the exogenous macro variables, then I estimate all of the remaining parameters using generalized method of moments, (GMM). Details are provided below.

6.1 Estimation of Aggregate Shocks

Changes in trade policy affect firms within an industry by affecting the prices of the imports they compete with, and by affecting the factor prices they face. The first task is to estimate the transition density for these two variables, $\Phi(s_{t+1}|s_t)$.[9] During recent decades Colombia has experienced frequent crises, and the real exchange rate has undergone big swings.[10] Between 1977 and 1998, it also experienced a radical change in its tariff policies.[11] These dramatic shifts lead me to choose a specification for $\Phi(s_{t+1}|s_t)$ that allows for regime switching (e.g., Hamilton, 1994).

The general idea behind switching models is that the parameters of the stochastic process are time-varying but constant conditional on an unobservable regime variable, r_t. In particular, Hamilton (1990) proposed the idea of Markovian regime shifts. Estimation amounts to recovering the parameters that describe the stochastic process behind each regime together with the transition probabilities that characterize Markovian transition between regimes. I estimate both simple VAR without allowing regime switching to constitute a base case and a MSIAH(2)-VAR(1), a MSIAH(2)-VAR(1), a VAR(1) model with 2 regimes and regime dependent intercept, autocorrelation coefficient and covariance matrix.

Assuming that at any point in time, the economy is in one of the two regimes, the MSIAH model parameterizes the two regimes as $(\beta_o^r, \beta_1^r, \Sigma^r)$.When regime $r \in \{1,2\}$ prevails, $s_t = \left[\overline{P}_{F,t}, w_t\right]'$ evolves according to

$$s_t = \beta_o^r + \beta_1^r s_{t-1} + \epsilon_t^r,$$

where $E(\epsilon_t^r \epsilon_t^{r'}) = \Sigma^r$. Switches between regimes are governed by the transition matrix

$$\Pi = \begin{bmatrix} p_{11} & p_{12} \\ p_{21} & p_{22} \end{bmatrix},$$

where $p_{ij},\ i \in \{1,2\}$ is the probability of moving to regime j, given that the economy is currently in regime i.

Using the EM algorithm (the Expectation Maximization Algorithm) described in Hamilton (1994) I obtain the maximum likelihood estimates reported in Table 7.[12] Data on import prices and wages are available for 1977 through 1998, so I use this entire time period rather than limiting the analysis to the plant-level sample years. The likelihood ratio tests indicate that the simple

[9] The details of constructing average import prices are given in the appendix.

[10] See Bond, Tybout and Utar (2005) for a discussion about the Colombian macroeconomic environment.

[11] Figure 1 and Figure 2 show the evolution of the industry-specific real wages and the average import prices during 1977 and 1998.

[12] I use the Ox Professional MSVAR software package developed by Hans-Martin Krolzig. Details are available at on-line at: http://www.economics.ox.ac.uk/research/hendry/krolzig/.

VAR model can be rejected in favor of the MSIAH model, so hereafter I will focus on the MSIAH results.

The estimated parameters indicate that in the first regime, import prices are lower and stable with lower wages. This corresponds to the period after 1991. The second regime picks up the period between 1984 and 1990, where both import prices and wages are higher with significant ups and downs in the average imported goods prices (see Figure 2 and Figure 3 for the actual series).[13] Below I refer to these regimes as liberal and protective respectively. The transition probabilities also indicate that both regimes are highly persistent (The probabilities of staying in the same regime for regime 1 and 2 are .92 and .83 respectively) and there is higher probability from switching from regime 1 (liberal regime) to regime 2 (protective regime).

6.2 Estimation of Structural Parameters

As a first step, I estimate the production function parameter θ to be .58 as the labor share of the total variable cost using plant-level data. Furthermore, I normalize the lower bound of the distribution of sunk entry cost F_L to zero. Finally I assume that entrants draw their initial productivity from a lognormal distribution with mean z which is to be estimated and the variance $\sigma_\mu^2/(1-a_1^2)$. That is, I let entrants to draw from a distribution which might differ from incumbents' productivity distribution in mean. This leaves me with 12 parameters to estimate. They are the cost parameters, (F_H, f, c_f, c_h), demand parameters, (α, η, γ), parameters of the productivity process for incumbents and entrants, $(a_0, a_1, \sigma_\mu^2, z)$. Given the stochastic processes for the aggregate shocks, I use the model to estimate remaining parameters. In estimation I use the simple VAR to characterize the aggregate shocks.

To estimate the remaining parameters, I embed the dynamic stochastic model defined above in a method of moments estimator. That is, I choose the set of parameters,

$$\delta = \begin{bmatrix} F_H & f & c_f & c_h & \alpha & \eta & \gamma & a_0 & a_1 & \sigma_\mu^2 & \sigma_\varepsilon^2 & z \end{bmatrix}, \tag{13}$$

that minimizes a measure of distance between moments implied by model simulations and their sample counterparts. For any given parameter combination δ, I construct the distance measure as follows. First, using the candidate parameter vector and the estimated values for all of the other model parameters, and the initial set of beliefs on the evolution of market aggregates, I numerically solve for the value functions (7) & (10). Using the method described above I update the beliefs

[13] Based on the smoothed regime probabilities, the regime classification for the MSIAH model estimation is the following:
Regime 1: 1978 - 1983 [1.0000]
1991 - 1998 [0.9863]
Regime 2: 1984 - 1990 [0.9994]

and solve for the new value functions with updated beliefs until I reach an equilibrium with self-fulfilling expectations. Then, using the policy functions in combination with randomly drawn aggregate shocks $(\overline{P}_{Ft}, w_t)$, firm-level productivity shocks (μ_{it}), and entry costs (F), I repeatedly simulate patterns of industrial evolution. I average over these simulations to construct the model moments. Finally, I calculate the measure of distance between the sample and simulated moments as,

$$X(\delta) = (\boldsymbol{d} - \boldsymbol{m}(\delta))' W (\boldsymbol{d} - \boldsymbol{m}(\delta)), \tag{14}$$

where $\boldsymbol{d}$ and $\boldsymbol{m}$ denote the data and model moments respectively, and W is a conformable matrix of weights.

The table below gives the 21 moments that are used in the estimation. More than half of the moments are employment characteristics of the industry including mean of job creation through entry, job creation through expansion of existing firms, job destruction through exit, job destruction through contraction of existing firms. In addition to that, I use general industry characteristics such as entry and exit rates, the number of operating firms.

Table 1: Moments

Mean Job Creation comes from Entry	Mean Entry Rate	Variance Log Employment
Mean Job Creation comes from Expansion	Variance Entry Rate	Mean % of Plants with No Change in Emp.
Mean Job Destruction comes from Exit	Mean Exit Rate	Covariance of Emp. Growth & Log Profit
Mean Job Destruction comes from Contraction	Variance Exit Rate	Covariance of Log Emp and Log Profit
Mean Employment Growth	Mean Log Profit	Mean Number of Plants
Variance Employment Growth	Variance Log Profit	Variance Number of Plants
Mean Import Penetration Rate	Mean Log Employment	Covariance of Lagged LogEmp &LogEmp

6.3 Preliminary Estimates

Table 8 reports the preliminary estimation results for the structural parameters.[14] I estimate the upper bound for the distribution of sunk entry cost, F_H, to be 4,550,000 peso.[15] Since I normalize the lower bound of the distribution to be 0, this estimate pins down the mean sunk entry cost which amounts to 2,275,000 pesos ($US 48,404). This cost amounts to 13% of the average value

[14] In this preliminary draft, I use the identity matrix as a weighting matrix, instead of the matrix of standard deviations. Identity matrix provides consistent estimates but not efficient. I will switch using the efficient weighting matrix in later versions of the paper.

[15] All values are in 1977 pesos if expressed in pesos or in 1977 USD if expressed in dollar.

of total sales in the industry. The sunk entry cost covers all the costs that are associated with starting-up a business and that cannot be recovered upon exit. These include government imposed legal costs, installation and customization costs, and opportunity cost of managerial time during the set-up period.

The per period fixed cost f is estimated to be 1,183,000 pesos ($US 25, 106). Since there is no capital in the production function, this cost reflects all the cost paid to fixed capital and the other per period fixed expenditures which are paid regardless of the production level, such as insurance and mortgage payments. (This cost amounts to approximately 7% of the average value of total sales.)

Hiring costs (c_h) are estimated to be 16,300 pesos, which amounts to approximately 3 months wages, while firing costs (c_f) are estimated to 25,600 pesos, or 4.5 months wages. Hiring costs cover all the advertising and recruitment expenditure associated with hiring workers as well as the training costs for the new employee. Probably the most significant component of the firing cost is the severance payment imposed by the government policies. Before the labor market reform in 1990, the severance payment amounted to one month's wage per year worked based on a salary at the time of separation.

Estimated productivity process parameters indicate that productivity process is persistent, (root is approximately .9), with relatively low variance, .06. The high persistence of productivity mitigates the effect of hiring and firing costs on firms' employment decisions. The mean value for the entrants' productivity distribution is estimated 1.38. This estimate indicates that entrants are on average are smaller. The intercept term for the incumbents' productivity distribution is estimated to be 1.41.

In the estimation, I fixed the market size, which is the multiplicative term in the equation (4) to be 250.[16] With this normalization, the estimate of α is 2514.2 and that of η is 14.13. Parameter γ, which is the index for the substitutability, is 29.7. This estimate gives the slope of the demand curve which is about -0.12. Hence the elasticity that each firm faces is about 12 percent of the ratio of its price to its quantity. The low magnitude of the slope indicates that the substitutability among product varieties are quite high.

Table 9 shows how well the model performs in fitting the data. Model performs well matching in job creation and destruction rates through entry and exit, but it overestimates the job creation and destruction through expansion and contraction. The percentage of plants with no change in employment is highly overestimated in the model. To some extent this reflects the fact that in the data, plants are counted expanding or contracting even if there is only tiny little bit change in the

[16] This is just a normalization, since this term is unidentifiable.

level of employment from one period to another. In the sample data, about 24 percent of plants adjust their employment by less than 1 percent from one year to another. The figure 4 shows the histogram of employment growth among continuing plants with the width of each bin being around 5 percent. The model's poor performance on matching import-penetration rate depends critically on the number of discrete points that I use to approximate the macro shocks, which is rather crude at this point. Despite the crudeness in grids, the model generally performs well.

7 Preliminary Simulation Results

Given all the estimated parameters, I next conduct several experiments to quantify the effects of changes in the economic environments. First, I use the estimated switching model to simulate industrial evolution and job flow patterns in an environment that bumps stochastically between the inward-oriented and the liberal (open) regime. That is, firms correctly perceive the current regime, the regime-specific transition densities for the macro shocks, and the transition density for the regimes reported in Table 7. The first step in this exercise is to discretize the two VAR processes identified as two regimes in the MSIAH model, using the methodology described in Tauchen (1991). Then, using the discretized version of the MSIAH model, I solve the industrial evolution model and find the equilibrium transition density for industry aggregates as well as the optimal decisions. Finally, given the simulated path for the aggregate shocks, I simulate 50 trajectories for the industry and take the averages over those trajectories.

Figure 6 shows the evolution of the number of firms in the regime switching environment, where the vertical bars indicate the timing of the regime switches. Because the probabilities of switching between regimes are low, the simulations show that the economy spends considerable time in each. This is particularly true for the liberal regime.[17] One thing to observe is that the volatility in the number of market participants increases significantly once the regime switches to protective environment. The same trend can be observed in Figures 6 and 7 for the net employment growth and productivity. The exercise I report in Table 10 compares average industry characteristics during the liberal periods with average characteristics during the closed periods. Thus, for both types of statistic, I am describing performance in the aftermath of a regime switch rather than the long run effects of keeping an industry in a single regime indefinitely.

Consistent with the reduced-form econometric studies reviewed in section 2, the model predicts that switching to the liberal regime is associated with a significant (12 percent) reduction in the number of jobs (Table 10).[18] The number of active firms also drops by roughly 16 percent, so

[17] The economy spends approximately 7.5 years in the protective regime and 11.5 years in the liberal regime.

[18] The predicted total employment for the regime 2 is 6282, and it falls to 5530 in the short-run (mean employment

a substantial fraction of the total reduction in jobs is due to net exit. Thus the model provides a structural explanation for the stylized fact that significant job destruction takes place on the entry/exit margin, and it suggests that studies based on panels of continuing firms are likely to miss a fundamental type of job flow.

Because exit takes place disproportionately at the low end of the productivity distribution, there are also productivity gains associated with the switch to a more liberal regime. More precisely, labor productivity increases by 5.6 percent on average. This, too, is consistent with econometric studies that show productivity gains in the aftermath of a trade liberalization due to the exit of inefficient firms (e.g., Pacvnik, 2002).

Together, these results confirm that the model I have developed is capable of replicating the patterns of correlation familiar from other studies. But given that I have modeled the underlying structure that generates these patterns, it is possible to perform counterfactual experiments. One interesting exercise is to compare two hypothetical economies—one permanently stuck in a liberal regime, and one stuck in a protected regime. The industry level results of this exercise are reported in Table 11. Notice that there is no permanent job gain associated with protection, even though we are limiting our attention to an import-competing industry. The reason is that, in addition to higher output prices under the protected regime, wages are higher too. Further, there is more volatility in the tariff-adjusted exchange rate, so the rates of job turnover are actually higher—both because of higher turnover in the number of plants, and more contraction and expansion among continuing plants. Hence, if the pattern of association between volatility and protection that emerges in Colombia is typical of developing countries, it is not necessarily in the long run interests of workers in import-competing sectors to lobby for protection.

8 Concluding Remarks

(To be completed)

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9 Appendix

9.1 Constructing Industry Specific Average Imported Good Prices

International trade data which is available online as the part of the NBER Trade Database is used to construct the average imported goods prices for the Colombian structural metal product industry.[19] This requires matching SIC (standard industrial classification)code for the industry under study with the SITC (standard international trade classification)codes of the products and constructing the group of products which are produced in this industry. The prices in the data set are in terms of dollar but they are reported by the importing country, Colombia. So exchange rate pass-through, if any, is already included in these prices[20] . Price series are converted into peso using Colombian nominal exchange rate, and the consumer price index using ,

$$\overline{P}_{F,t} = DP_{F,t}(1+\tau_t)(\frac{e_t}{P_t^{CPI}}), \tag{15}$$

where $DP_{F,t}$ denotes the average price of imported varieties in dollar term, τ_t denotes the tariff rate for the four digit industry, e_t denotes the nominal exchange rate, P_t^{CPI} denotes the consumer price index at period and subscripts t denotes the time. Notice that the real exchange rate variation is going to be picked up by the last term, $\frac{e_t}{P_t^{CPI}}$.

[19] The dataset covers the years 1962-2000, and is constructed from United Nations trade data by Robert Feenstra and Robert Lipsey, under a grant from the National Science Foundation to the NBER.

[20] Empirical research showed that the domestic prices of imported products do not fully respond to exchange rates. See Goldberg & Knetter (1997) for a good survey on exchange rate pass-through.

Table 2: **Structural Metal Products**

	1980	**1984**	**1985**	**1988**	**1991**
Export Orientation Ratio	0.08	0.017	0.046	0.11	0.19
Import Penetration Ratio	0.56	0.50	0.38	0.53	0.64

Table 3: Structural Metal Products (1977-1991)

avg output share of entrants	**avg entry rate**	**avg exit rate**
% 15	% 22	% 21

Table 4: Job Creation and Destruction in Colombian Metal Prod. Ind.

	Expansion	**Contraction**	**Entry**	**Exit**
Year	$(E_t - E_{t-1})/L_{t-1}$	$(C_t - C_{t-1})/L_{t-1}$	B_t/L_{t-1}	D_{t-1}/L_{t-1}
1978	.155	-.048	.223	-.122
1979	.063	-.115	.116	-.094
1980	.084	-.065	.138	-.201
1981	.074	-.053	.167	-.225
1982	.089	-.100	.222	-.160
1983	.062	-.071	.131	-.292
1984	.053	-.124	.330	-.165
1985	.109	-.108	.155	-.113
1986	.076	-.071	.090	-.197
1987	.064	-.139	.033	-.189
1988	.090	-.068	.509	-.069
1989	.113	-.039	.086	-.071
1990	.050	-.090	.045	-.065
1991	.035	-.113	.094	-.124

Table 5: Net and Gross Flows in the Sample Data

Year	Net Change $\left(\frac{E_t - E_{t-1}}{L_{t-1}} + \frac{B_t}{L_{t-1}}\right)$	$\left(\frac{C_{t-1} - C_t}{L_{t-1}} + \frac{D_{t-1}}{L_{t-1}}\right)$	Total	Gross Turnover $\left(\frac{E_t - E_{t-1}}{L_{t-1}} + \frac{B_t}{L_{t-1}}\right)$	$\left(\frac{C_{t-1} - C_t}{L_{t-1}} + \frac{D_{t-1}}{L_{t-1}}\right)$	Total
1978	0.101	0.107	0.208	0.345	0.203	0.548
1979	0.022	-0.052	-0.03	0.21	0.178	0.388
1980	-0.063	0.019	-0.044	0.339	0.149	0.488
1981	-0.058	0.021	-0.037	0.392	0.127	0.519
1982	0.062	-0.011	0.051	0.382	0.189	0.571
1983	-0.161	-0.009	-0.17	0.423	0.133	0.556
1984	0.165	-0.071	0.094	0.495	0.177	0.672
1985	0.042	0.001	0.043	0.268	0.217	0.485
1986	-0.107	0.005	-0.102	0.287	0.147	0.434
1987	-0.156	-0.075	-0.231	0.222	0.203	0.425
1988	0.44	0.022	0.462	0.578	0.158	0.736
1989	0.015	0.074	0.089	0.157	0.152	0.309
1990	-0.02	-0.04	-0.06	0.11	0.14	0.25
1991	-0.03	-0.078	-0.108	0.218	0.148	0.366

Table 6: Structural Metal Products Industry (in percentages)

Year	**Expanding Plants**	**Contracting Plants**	**Plants with No Change**
1978	0.48	0.39	0.13
1979	0.42	0.47	0.11
1980	0.41	0.46	0.12
1981	0.43	0.4	0.17
1982	0.39	0.44	0.16
1983	0.34	0.5	0.16
1984	0.33	0.56	0.11
1985	0.29	0.62	0.09
1986	0.47	0.39	0.14
1987	0.54	0.32	0.14
1988	0.51	0.33	0.15
1989	0.44	0.36	0.2
1990	0.35	0.43	0.22
1991	0.32	0.47	0.21

Data source is DANE

Table 7: Estimation of Aggregate Shocks

	Simple VAR		Markov Switching VAR(MSIAH)	
	$\overline{P}_F$	w	$\overline{P}_F$	w
β_0^1	1.814 (1.7)	2.977 (0.699)	0.686 (0.59)	2.41 (0.69)
β_0^2			5.01 (4.72)	5.38 (0.52)
β_1^1	0.575 (0.19)	-0.148(0.07)	0.8 (0.07)	-0.012 (0.08)
	0.065 (0.349)	0.467 (0.143)	0.064 (0.13)	0.435 (0.15)
β_1^2			0.326 (0.51)	-0.186 (0.06)
			-0.397 (1.08)	-0.04 (0.12)
Σ^1	0.0504	0.005171	0.0041527	-0.0026153
	0.005171	0.00846	-0.0026153	0.0055677
Σ^2			0.10394	0.0076065
			0.0076065	0.0012653
Π			0.9235	0.0765
			0.1686	0.8314
Log Likelihood	25.79		44.0195	
H_0 :same as base model			$\chi^2(12)$ =36.45	

Table 8: Estimated Cost and Demand Parameters for Colombian Metal Products Ind

	Parameters	**Standard Errors**
Mean Sunk Entry Cost ($\frac{F_H}{2}$)	2275*	n.a.
Fixed Cost, f	1180*	n.a.
Firing Cost, c_f	25.6*	n.a.
Hiring Cost, c_h	16.3*	n.a.
Demand Parameter, α	2514.2	n.a.
Demand Parameter, η	14.13	n.a.
Demand Parameter, γ	29.7	n.a.
Incumbents' Productivity Process, intercept ($a_{0\mu}$)	1.41	n.a.
Incumbents' Productivity Process, root, ($a_{1\mu}$)	0.9016	n.a.
Incumbents' Productivity Process, variance (σ_μ^2)	0.06	n.a.
Entrants' Productivity Distribution,mean (z)	1.38	n.a.
Variance of Imported Varieties, (σ_ε^2)	2.54	n.a.
Objective Function, (X)	39.6439	

*In thousand 1977 pesos.

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Table 9: Model Fit

	Simulated Moments	**Data Moments**
Expected Value of Log Employment	3.0545	3.13
Variance of Log Employment	0.3257	0.8
Expected Value of Log Profit	6.8546	6.96
Variance of Log Profit	1.6247	2.44
Expected Growth in Employment	-0.0432	-0.016
Variance of Growth in Employment	0.0794	0.111
Expected Entry Rate	18.7618	24
Expected Exit Rate	18.7664	22
Variance of Entry Rate	0.0005	0.1937
Variance of Exit Rate	0.0013	0.082
Covariance of Log Employment and Lagged Log Employ.	0.2310	0.781
Covariance of Log Employment and Log Profit	0.5908	0.916
Covariance of Employment Growth and Log Profit	0.3261	0.02
Expected Log Number of Firms	5.1304	5.029
Variance of Log Firms	0.0033	0.0364
Expected % of Firms with No Change in Employment	0.6211	0.174
Expected Job Creation Through Entry	0.1852	0.167
Expected Job Destruction Through Exit	-0.1699	-0.149
Expected Job Creation Through Expansion	0.1531	0.079
Expected Job Destruction Through Contraction	-0.1921	-0.086
Expected Import Penetration Rate	0.1858	0.5

Table 10: Transitional Dynamics

	Protective	**Liberal**
Net Employment Growth	0.0010	-1.3565e-004
Mean Gross Flows	0.5463	0.5368
Variance Gross Flow	0.0428	0.0139
Total Employment	6.2820e+003	5.5307e+003
Mean Productivity of Incumbents	6.9504	7.3370
Mean Number of Firms	221	191
Mean Entry	0.1802	0.1498
Mean Exit	0.1285	0.1604
Mean Job Destruction	0.2291	0.2733
Variance Job Destruction	0.0454	0.0161
Mean Import Price	134	117
Mean Total Domestic Output	10220	9006

Table 11 : The Steady State Comparison of Liberal vs. Protective Environment

	regime 1(liberal)	**regime 2 (protective)**
Aggregate Shocks		
Mean Import Prices	78.8383	124.7576
Variance of Average Import Prices	24.9896	1.48E+03
Mean Real Wage	64.8179	73.4475
Variance of Real Wage	20.5238	4.714
Industry Characteristics		
Mean Number of Firms	169.6563	171.763
Variance of Number of Firms	2.198	6.7426
Mean Entry Rate	18.4017	18.7680
Mean Exit Rate	18.4065	18.7627
Mean (Unweighted) Productivity of Incumbents	7.713	7.712
Mean (Unweighted) Productivity of Entrants	4.6136	4.6178
Mean (Unweighted) Productivity of Exiting Firms	3.2741	3.2819
Mean Share Weighted Productivity of Incumbents	8.1028	8.1246
Mean Profit	6.9224	6.785
Variance of Profit	1.4686	1.8704
Mean Import Penetration Rate	0.2186	0.0756
Mean Domestic Price	77.2615	81.3096
Mean Domestic Output	45.1293	42.3362
Employment Characteristics		
Mean Gross Flows	0.6830	0.7242
Variance Gross Flows	7.4933e-004	8.1515e-004
Mean Job Creation Through Expansion	0.1485	0.1597
Mean Job Creation Through Entry	0.1837	0.1861
Mean Job Destruction Through Contraction	-0.1821	-0.2066
Mean Job Destruction Through Exit	-0.1681	-0.171
Variance of Job Creation Through Entry	1.78E-04	1.76E-04
Variance of Job Creation Through Expansion	0.0011	0.0012
Variance of Job Destruction Through Contraction	4.09E-04	5.51E-04
Variance of Job Destruction Through Exit	8.12E-05	4.51E-05

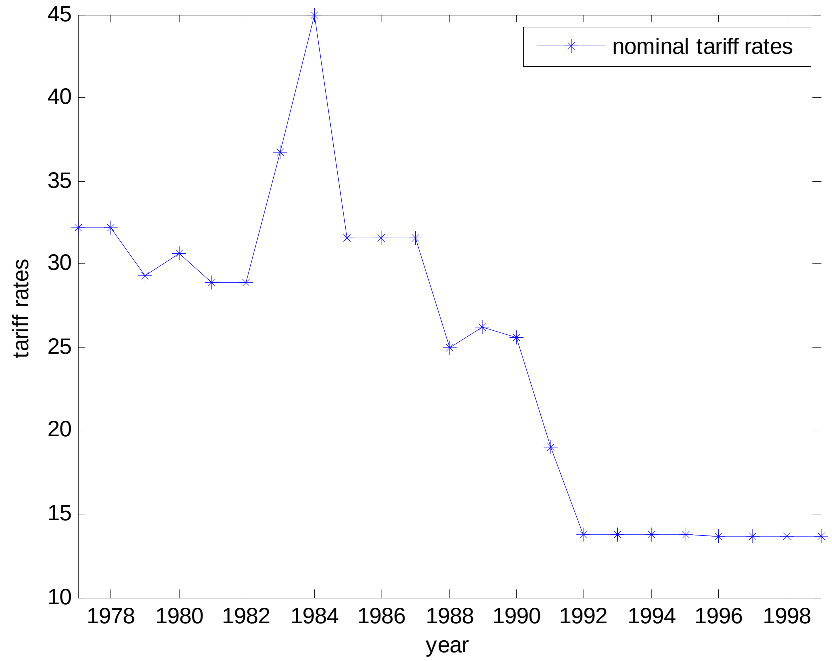

Figure 1: Nominal Tariff Rates for Structural Metal Products Industry

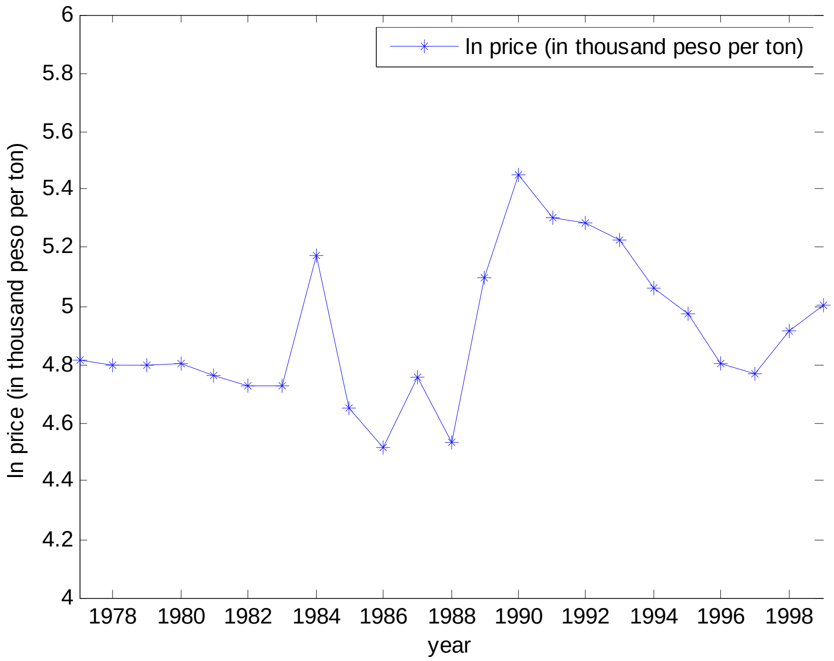

Figure 2: Industry Specific Import Prices

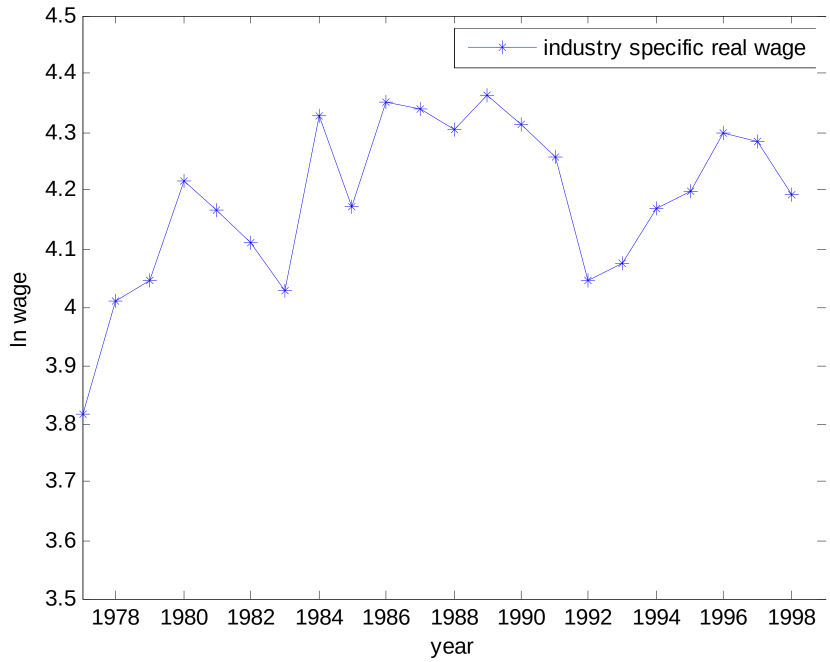

Figure 3: Industry Specific Real Wage

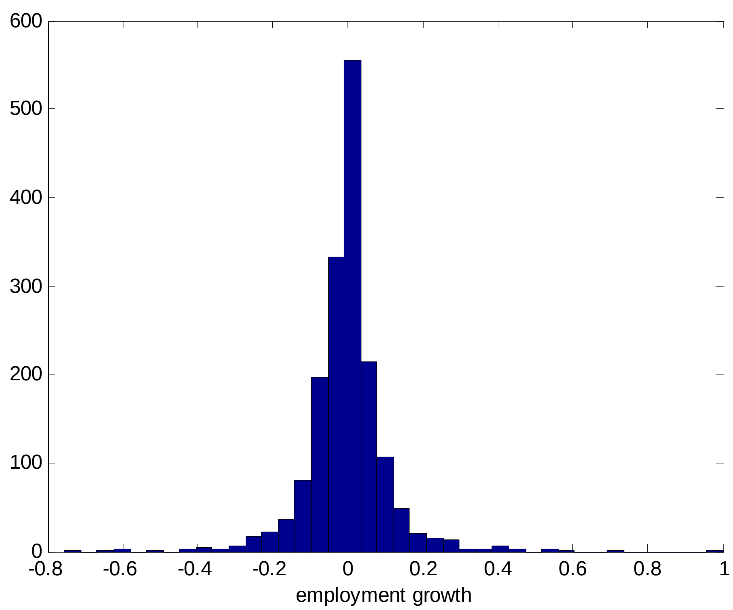

Figure 4: Employment Growth (1977-1991)

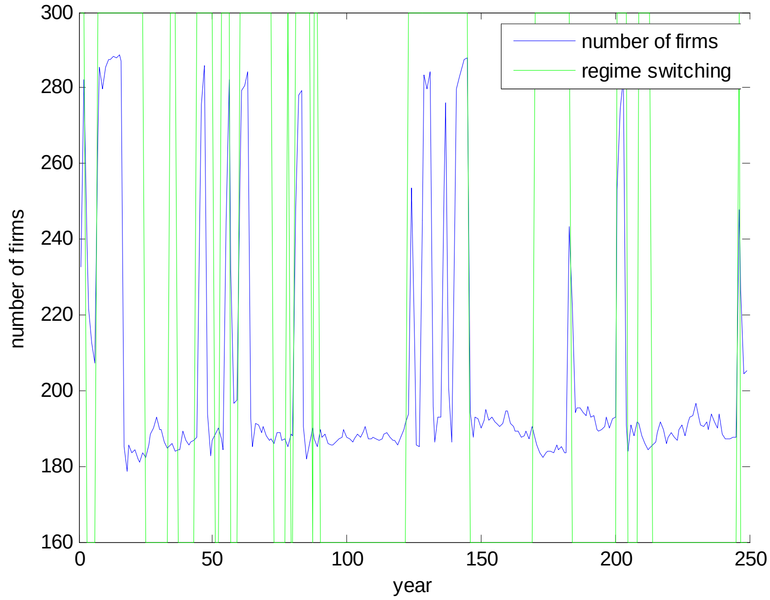

Figure 5: Evolution of the Number of the Firms

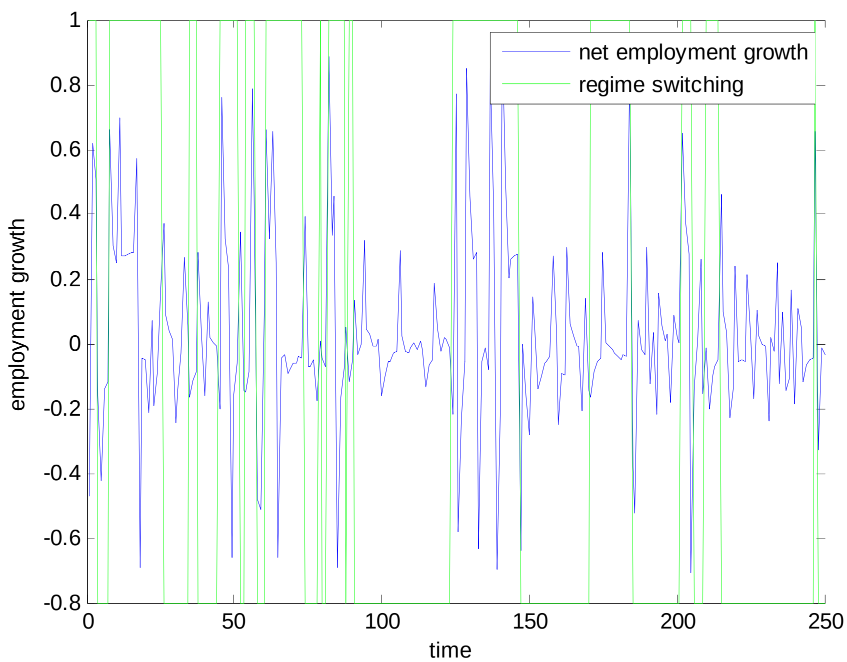

Figure 6: Evolution of the Net Employment Growth

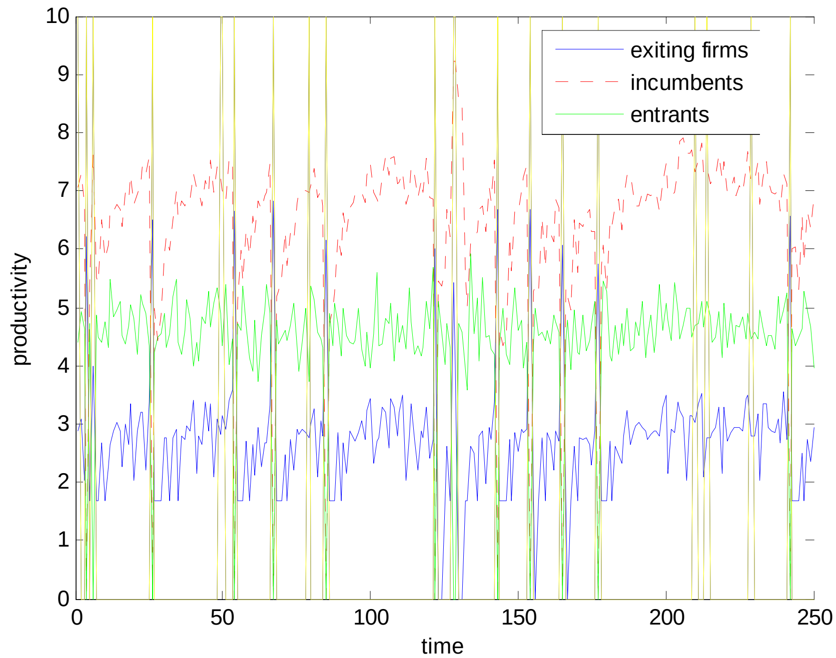

Figure 7: Evolution of Productivity of Firms