BANCO DE PORTUGAL

Economics Research Department

Labor Market and Kaleidoscopic Comparative Advantage

Daniel Traça

WP 4-00 June 2000

Please address correspondence to Daniel A. Traça, Economics Research Department, Banco de Portugal, Av. Almirante Reis, nº 71, 1150-012 Lisboa, Portugal Tel.#351-1-3130000; Fax#351-1-3143841;e-mail:traca@econ.insead.fr

Labor Markets and Kaleidoscopic Comparative Advantage

Daniel A Traca[1]
INSEAD and Banco de Portugal

June 8, 2000

[1]email: traca@econ.insead.fr ; fax: +33 1 60 74 61 71. This paper was written while the author was a visiting fellow at the Department of Economic Studies at the Bank of Portugal. The author acknowledges the support of the Bank of Portugal.

Abstract

This paper addresses the labor market implications of an increase in openness and foreign competition. It develops a model where industry-specific productivity shocks create uncertainty, producing an environment of *kaleidoscopic comparative advantage* (Bhagwati, 1998). The key assumption is that risk markets are imperfect, as wage-contracts are subject to uninsurable bankruptcy risk. In this context, the paper analyzes the consequences for wage levels, wage volatility, job-instability and income distribution, of the openness of previously non-traded industries to the forces of international trade and foreign competition.

1 Introduction

The period from the mid 70´s to the mid 90's has been a distressful one for workers in industrialized countries, namely the United States. First, wage growth has declined dramatically, with a more pronounced decline for unskilled workers contributing to an increase in the wage-skill gap (Mishel and Bernstein, 1994; Katz and Krueger, 1999).[1] Second, wage volatility has risen (Gottschalk and Moffit, 1994). And third, evidence from displacement rates shows an increase in job insecurity, in particular for skilled workers (Farber, 1997; Aaronson and Sullivan, 1998), while worker surveys confirm the rise in concerns about job security since 1977 (Schmidt and Thompson, 1997).

This paper argues that these three phenomena are intertwined and related to the rise in international competition, due to the globalization. Explicating Bhagwati´s (1998) *kaleidoscopic comparative advantage*, we show how international trade expands the volatility of profitability, when it arises from i.i.d. industry-specific shocks to productivity.[2] Then we address the implications for the relationship between openness and labor markets, when firms cannot provide full insurance.[3]

To capture the imperfection of risk markets, we assume that an employer´s ability to borrow is limited: when profitability drops below a given boundary, the firm faces bankruptcy and has to default on the wage contract established ex-ante. The chief implication is that, since profitability depends negatively on the wage, the probability of bankruptcy is endogenous to the contract.

---

[1] According to Katz and Krueger (1999), real earnings show an absolute decline in1980-1996, while compensation (incl. fringe benefits) shows only slow growth. Decomposing by education level, Mishel and Bernstein (1994) show a decline in real wages for *all* categories in 1973-1993. For evidence on the expansion of the wage-skill gap, see Slaughter and Swagel (1997).

[2] Under foreign competition, i.e. in tradables, the independence of the price from domestic supply conditions implies a full transmission of the productivity shock to profitability. By contrast, if an industry is sheltered from foreign substitutes, the transmission of the productivity shock to profitability is weakened by a conflicting supply effect on the price. Alternatively, one could operationlize Bhagwati´s concept by postulating the presence of external risk, due to terms of trade variability. The results of this paper would remain unchanged.

[3] Due to the modest significance of trade with developing countries, the Stolper Samuelson effects account for a small part of the increase in relative wages (see Cline, 1997, for a survey).

Now, one implication of *kaleidoscopic comparative advantage* is that, ceteris paribus, the likelihood of bankruptcy is higher in tradable than in non-tradable industries.[4] Thus, to hedge some of the increased bankruptcy risk, workers accept wages below their expected productivity, and employers capture the surplus (profit).[5] Nevertheless, tradable industries remain more volatile, with higher wage volatility, job-instability and employment variability, in equilibrium. And, as a result, pay a risk-compensating wage-premium which, along with the surplus paid to employers, implies a productivity premium for tradable industries.[6] Note that, in terms of the maximization of domestic output, this implies that the allocation of labor to tradable industries is sub-optimal, which constitutes a distortionary cost of volatility.

This paper addresses the implications of an increase in foreign competition, by looking into the effects of opening a non-tradable industry to international trade. As mentioned earlier, foreign competition increases the volatility of a firm´s profitability, due to *kaleidoscopic comparative advantage.* As the industry hedges by renegotiating wage contracts, the profits of its employers increase and the welfare of its workers falls.[7] In the long run, the consequences for the economy-wide labor markets include: first, an increase in wage volatility and job-instability; second, a rise in the share of profits in national income; and third, a decline in real wages and in the welfare of workers, when the gains from trade are outweighed by the wage losses related to the increase in either (i) the bankruptcy costs, (ii) the higher share of profits, or (iii) the distortionary cost of volatility.

Lastly, we digress from the benchmark model to look at educational heterogeneity of workers. We take it that, since education lowers mobility costs,

[4]Bertrand (1999), in an empirical study, claims that import competition hinders the contractual risk-sharing agreement of traditional labor markets, by increasing financial pressure and expanding default risk. Rodrik (1997) argues that international competition lowers wages and increases wage volatility, by reducing the elasticity of demand.

[5]Since employers willing to pay more than the going wage are unable to attract workers, the equilibrium entails a form of labor rationing. See Williamson (1987) for an application to credit-rationing in financial contracts.

[6]Gourrinchas (1998) shows evidence of higher employment volatility in tradable indsutries. Bernard and Jensen (1995) argue that there is a productivity and a wage premium in exportables. Finally, according to Abowd and Ashenfleter (1981), there is a wage premium in industries with higher lay-off rates.

[7]Alan Greenspan (1997) testified to the US congress that: "atypical restraint on compensation increases has been evident for a few years now and appears to be mainly the consequence of greater work insecurity."

skilled workers are less averse to bankruptcy risk. Under these conditions, an increase in foreign competition produces an increase in the wage-skill gap and in the relative job insecurity of skilled workers. The reason being that the latter, untroubled by displacement, are less willing than the unskilled, to sacrifice their wage for the sake of job security.

The next section introduces the model, and looks at the equilibrium in goods' markets. Section 3 looks at the features of the optimal contract and the equilibrium in labor markets. Section 4 looks at the effects of an increase in openness and foreign competition. Section 5 concludes. The appendix compares the welfare of workers under wage-contracts with spot labor markets.

2 The Model

Consider a small open economy with a continuum of measure one of goods (industries) defined in [0,1]. The production function in each industry is given by

$$z_j = A_j l_j \tag{1}$$

where A_j is random variable independent across industries. A_j is uniformly distributed, with distribution F, given by

$$F\{A_j\} = \begin{cases} 1 & \text{if } A_j/\mu > 1 + \theta/2 \\ [A_j/\mu - (1-\theta/2)]\theta^{-1} & \text{if } 1 - \theta/2 \leq A_j/\mu \leq 1 + \theta/2 \\ 0 & \text{if } A_j/\mu < 1 - \theta/2 \end{cases} \tag{2}$$

with $0 < \theta < 2$, where $E(A_j) = \mu$. Using the coefficient of variation (σ) to measure the dispersion, we obtain $\sigma_A = \theta/\sqrt{12}$. Hence θ captures the exogenous uncertainty in the model.

All consumers have identical preferences across goods, given by

$$C = \exp(\textstyle\int \ln z_j) \tag{3}$$

Hence, taking aggregate expenditure as the numeraire, the aggregate demand for z_j is:

$$z_j^d = p_j^{-1} \tag{4}$$

In all industries, firms/ employers are price-takers. A subset of measure T of the continuum of industries produces tradable goods (henceforth, the tradable sector), indexed by $j \leq T$. Correspondingly, the non-tradable sector, of measure $1 - T$, includes all goods indexed by $j > T$.

Now, we can address the equilibrium prices of goods. In the non-tradable sector, domestic supply needs to equal demand, yielding:

$$p_j = z_j^{-1} \quad j > T \tag{5}$$

In the tradable sector, relative prices are given from abroad. We assume that they are not stochastic, and without loss of generality take them as unitary: $p_j = p_t$, $\forall j < T$. Using the trade balance equation, i.e. $\int_0^T p_j z_j = \int_0^T p_j z_j^d$, we obtain from (4):

$$p_j = p_t = \left(T^{-1} \int_0^T z_j\right)^{-1} \quad j \leq T \tag{6}$$

Equations (5) and (6) show that the elasticity of the price to a supply shock (e.g. a productivity shock) is different for tradable and non-tradable industries, due to the role played by international competition. Equation (5) shows that for a non-tradable good, a supply shock affects the price of the good negatively. By contrast, for tradable goods, foreign competition keeps relative prices constant. The price index for tradables (p_t) is only affected by a supply shock that is large enough to create an imbalance in the current account. However, since each industry is part of a continuum of tradable industries, an industry's supply shock has only a negligible effect on p_t, as can be seen in (6). In sum, in a non-tradable industry, the price of the good reacts negatively to a supply shock in the industry, while in a tradable sector the price is unaffected by a supply shock.

3 Labor markets

We assume that there are a continuum of measure one of workers, each with one unit of labor, i.e. the aggregate labor supply is unitary. Workers have access to neither insurance nor credit markets, yielding that their expenditure equals their income, which equals their wage. They are risk averse, with utility given by $U = \rho^{-1} C^{\rho}$, where $1 - \rho > 0$ is the coefficient of risk aversion and C is given in (3). Letting $P \equiv \exp \int \ln p_j$ denote the consumer price index (CPI), taking (4)-(6), the indirect utility of a worker with wage w_j is

$$\begin{aligned} U &= \rho^{-1}(w_j/P)^{\rho} \quad \rho < 1 \\ \ln P &= -T \ln\left(T^{-1} \int_0^T z_j\right) - \int_T^1 \ln z_j \end{aligned} \tag{7}$$

On the other hand, there is an infinite supply of risk-neutral employers (firms) which can freely enter the labor and the goods market.

Events take place as follows. First, workers choose an industry they will work in. Second, each employer offers an ex-ante wage contract, which a worker can take on. One worker and one employer are thus paired, and the worker becomes unproductive in any other industry or employer. Finally, the shock occurs, and goods market clear, as described in the previous section.

In this section, we look at the equilibrium in industry-specific labor markets. The allocation of workers across the different industries is addressed in the next section. Since the only distinction between the different industries lies on the extent of their openness to foreign competition, we assume that the equilibrium allocation of workers across industries is symmetric within each sector, in the sense that the ex-ante supply of labor is identical for industries in the same sector. As a result we can obtain an expression for p_j, $\forall j$.

Remark 1 *(quasi-symmetry) The allocation of labor is symmetric within each sector, i.e.* $l_j = l_n$, *for* $j > T$ *and* $l_j = l_t$, *for* $j \leq T$, *with* $(1-T)l_n + Tl_t = 1$. *Consequently, the price in non-tradable industry* j *is given by:* $p_j = (A_j l_n)^{-1}$, *for* $j > T$; *while for the tradable sector, we obtain* $p_j = p_t = (\mu l_t)^{-1}$, *for* $j \leq T$.

Proof. Take the assumption of symmetry. The price in a non-tradable industry is immediate from (1) and (5). Meanwhile, in tradables, (1) and (6) yield: $p_t^{-1} = T^{-1} \int_0^T z_j$. Applying the law of large numbers, we obtain the expression for p_t. ■

3.1 Wage Contracts

Now, we address the wage contracts offered by employers, before productivity is known. To set notation, henceforth we will denote by $V_j \equiv p_j A_j$ the value of a worker´s productivity, also referred to as nominal productivity, where V_j is a function of the shocks in all industries: A_0, ... , A_j, ..., A_1.

Under perfect risk markets, given the presence of idiosyncratic shocks in a continuum of industries, the optimal contract would provide a worker with a non-stochastic nominal wage, given by the expected value of her nominal productivity: $E(V_j)$.

To capture the implications of imperfect risk markets, we address the possibility of bankruptcy risk. We assume that the employer has limited access to credit markets: if w denotes the contract wage, the employer defaults when $\pi(w) \equiv (V_j - w) < -\iota w$, where π denotes the cash-flow per worker and $\iota \in]0,1[$ captures the performance of risk markets. Of course, employers are only willing to offer a contract that ensures non-negative expected profits.[8]

To simplify, we restrain some key features of the contract. First, to ensure that the contract wage is independent of productivity, we assume that productivity is unobservable to workers. Second, we establish that the employer is reliable, i.e. he will not misrepresent his bankruptcy. This can be motivated by a reputation cost, in the case of an implicit contract, or by the possibility for costly verification by a third party. Finally, we take it that the net income of the worker and of the employer in the case of bankruptcy are zero. Implicitly, the firm´s output is used to pay for bankruptcy costs (e.g. state verification by the court, job reallocation and unemployment by the worker, etc...). In sum, the wage contract sets a non-renegotiable, non-contingent wage, to be paid unless bankruptcy occurs.[9]

Letting $\phi(\tilde{w}) \equiv \int_{\pi \geq -\iota\tilde{w}} (\mu\theta)^{-1}$ denote the survival probability with wage $\tilde{w}$, i.e. the probability that $\pi \geq -\iota\tilde{w}$, the optimal contract is characterized by the solution to[10]

$$\max_{\tilde{w}} \frac{1}{\rho}\phi(\tilde{w})(\tilde{w}/P)^{\rho} \tag{8}$$

[8]If $\iota = 0$, there are no risk markets, and the firm closes whenever cash flow is negative; if $\iota = 1$ risk markets are perfect, and the firm can cover negative cash-flows. In equilibrium, the employer may sign a contract with negative cash-flows in some states of nature (e.g. $p_j A_j < w$), provided expected profits are non-negative.

[9]Our first assumption has been addressed at length in the literature (for a survey, see Parsons 1991). Regarding the second assumption, the discussion of the optimal contract under costly state verification, can be found in Williamson (1987), applied to the financial contract literature. Alternatively, Diamond (1984) stresses the reputation costs of bankruptcies. The third assumption is less realistic, since it implies that bankruptcy costs are stochastic and equal to the bankrupt firm´s output. Relaxing this would complicate the model without changing its implications. Finally, the *suppression of renegotiation* arises in equilibrium because the commitment to the firm can be seen as a firm-specific investment (see Hall 1995).

[10]Under competitive spot labor markets, the ex-post nominal productivity corresponds to the equilibrium wage. The appendix in section 5 establishes that for sufficiently preforming risk markets, i.e. for ι sufficiently high, the worker is better off with a contract, and the inherent bankruptcy risk, than opting for the spot market, with the related wage volatility. Here we take as given the prevalence of the optimal contract.

$$\text{s.t.} \int\limits_{\pi \geq -\iota\tilde{w}} V_j \geq \phi(\tilde{w})\tilde{w}$$

We start by addressing the volatility of a worker´s nominal productivity (V_j), arising from productivity shocks, in tradable and non-tradable industries.

Lemma 1 *(Kaleidoscopic Comparative Advantage) The coefficient of variation of nominal productivity is higher in tradable industries. Moreover, nominal productivity in non-tradable industries is non-stochastic.* ($\sigma_{V_t} > \sigma_{V_n} = 0$).

Proof. Using remark 1 to substitute for p_j, we obtain for non-tradable industries: $V_j = p_j A_j = l_n^{-1}$, $j > T$, while for tradables, we get: $V_j = p_j A_j = l_t^{-1} A_j/\mu$, $j \leq T$. To conclude, note that nominal productivity in non-tradables is non-stochastic, while in tradables it is stochastic. Thus the coefficient of variation in larger in the tradable sector. ■

To understand this asymmetry, note that the productivity shock affects nominal productivity in two ways. First, it affects the physical productivity (measured in units of the good). Second, it may affect the price of the good, due to the impact on supply. In tradable industries, the price is unaffected by supply changes, as discussed previously. Thus, the volatility of the shock is fully transmitted to nominal productivity. By contrast, in the non-tradable sector, the productivity shock has an effect on the price that conflicts with that on physical productivity (e.g. a positive productivity shock reduces the price of the good), thus smoothing the impact on nominal productivity. Hence the volatility of nominal productivity in the non-tradable sector is smaller than in the tradable sector.

Now, we can obtain the solution to the optimal contract problem in (8), as shown below:

Lemma 2 *Let* $\psi(\iota, \rho, \theta)$, $\phi_t(\iota, \rho, \theta)$ *and* $\varphi(\iota, \rho, \theta)$ *be given by:*

parameter region	$\psi =$	$\phi_t =$	$\varphi =$
a: $\begin{cases} \rho > (\theta^{-1} - 1/2) > 0 \\ \iota \in [0, (1+2\rho)^{-1}[\end{cases}$	$\frac{(1+\theta/2)\rho}{(1+\rho)(1-\iota)}$	$\frac{\theta^{-1}+1/2}{1+\rho}$	$\frac{(1+\theta/2)[1-(1+2\rho)\iota]}{(1+\rho)(1-\iota)}$
b: $\begin{cases} \rho > (\theta^{-1} - 1/2) > 0 \\ \iota \in [(1+2\rho)^{-1}, \theta/2[\end{cases}$	$\frac{1+\theta/2}{1+\iota}$	$\frac{1+\theta/2}{1+\iota}\frac{\iota}{\theta/2}$	0
c: $\begin{cases} \rho \leq (\theta^{-1} - 1/2) \\ \iota \in [0, \theta/2[\end{cases}$	$\frac{1-\theta/2}{1-\iota}$	1	$\frac{\theta-2\iota}{1-\iota}$
d: $\iota \in [\theta/2, 1]$	1	1	0

under the optimal contract, the industry-specific wage (w) and welfare (U), the survival probability (ϕ) and the expected profits per worker ($E(\pi)$) are given by

	$w_j =$	$U_j =$	$\phi_j =$	$E(\pi_j) =$
Tradable ($j \leq T$)	$\psi(.)l_t^{-1}$	$\phi_t \psi^\rho (l_t P)^{-\rho}$	$\phi_t(.)$	$l_t^{-1}\varphi(.)\phi_t(.)/2$
Non-Tradable ($j > T$)	l_n^{-1}	$(l_n P)^{-\rho}$	1	0

Proof. For non-tradable industries, the result is immediate, given the features of the spot market. Now, for the tradable industries, take $p_j = p_t$. Since each good is infinitesimal in the continuous of tradable goods, p_t and P are not correlated with A_j. Thus, letting $\tilde{\psi} \equiv \tilde{w}/(p_t\mu)$:(a) the objective function can be re-written as $(\rho\theta)^{-1}(p_t\mu/P)^\rho[(1+\theta/2)\tilde{\psi}^\rho - \tilde{\psi}^{1+\rho}(1-\iota)]$; (b) the non-negative profit constraint yields: $\psi \leq (1+\theta/2)(1+\iota)^{-1}$; (c) expected profit per worker is given by $E(\pi_t) = \mu p_t \varphi \phi_t/2$, with $\varphi \equiv (1+\theta/2-\psi(1+\iota))$; (d) a worker´s welfare is obtained by substituting w_t for E in (7); and finally (d), given (2), the survival probability can be written as: $\phi_t = (\theta^{-1}+1/2) - \theta^{-1}\psi(1-\iota)$. Now,case a corresponds to the interior solution. Case b depicts the region where the constraint is binding. Case c shows the area where ϕ_t reaches its upper bound. Finally, case d is obtained when both the upper bound of ϕ_t and the constraint are binding. To conclude, μl_t can substitute for p_t. ■

The contract in the non-tradable sector is risk-less, offering to a worker her nominal productivity, because nominal productivity in these industries is non- stochastic (see lemma 1). In the tradable sector, however, nominal productivity is volatile, and the optimal contract is determined by the three parameters in the model (θ, ρ, ι), as shown in the lemma.

Note that, in certain cases, employers make positive expected profits, despite free-entry. The reason is that, even if an entrant would offer a higher wage, workers would opt against it, since that would entail a higher probability of bankruptcy. Similarly to Williamson´s (1987) discussion of credit rationing under costly state verification, this result shows that, when workers do not observe productivity and there is a positive default probability, a labor-rationing equilibrium may arise, where employers willing to offer a higher wage contract are not able to find workers.

The four types of contracts depicted in the lemma, each of which will arise under the right parameter configuration, can be characterized by their insurance provision and labor-rationing properties, as shown in the table.

Table 1: Features of Equilibrium Contract in Tradables, by parameter regions

	Labor Rationing $[E(\pi_t) > 0]$	Market Clearing $[E(\pi_t) = 0]$
Bankruptcy Risk $[\phi_t < 1]$	a	b
Full insurance $[\phi_t = 1]$	c	d

In region **d**, risk markets are perfect. The employer provides a full insurance contract, paying a worker´s expected nominal productivity. In region **c**, although risk markets are not perfect, low uncertainty or high risk aversion allow for full-insurance. For this, the worker accepts a wage that the employer can afford even in the worst realization of productivity. Consequently, employers make positive expected profits and labor-rationing occurs. In region **b**, bankruptcy risk arises, since higher uncertainty or low risk aversion make workers unwilling to pay for insurance. The profitability constraint is binding, and workers are paid their truncated expected nominal productivity.[11] Finally, in region **a** coexist labor rationing and bankruptcy risk. Workers are willing to hedge only partially, since a full insurance contract now is too costly, given the poor performance of risk markets.

3.2 The Allocation of Labor

To conclude, we address the equilibrium the allocation of workers to the different industries. Henceforth, we assume that $\iota < \theta/2$, thus ignoring the perfect risk markets equilibrium in case d.

Since ex-ante workers can move freely between the industries, in equilibrium, the expected welfare of a worker has to be the same regardless of the industry she chooses. By assuming that the allocation of labor is symmetric for industries within the same sector, we have ensured that the expected welfare of workers within the same sector is identical.

Now, solving for the allocation of workers between the tradable and nontradable sector, i.e. imposing $U_t = U_n$, yields:

Lemma 3 *The equilibrium allocation of labor across industries yields*

$$l_n = [1 - T + T\phi_t^{1/\rho}\psi]^{-1}$$

[11] Note that in this case, the wage declines as the performance of risk markets (ι) improves. This counter-intuitive result arises because with better insurance markets, the probability of survival improves, i.e. less productive workers will be paid their wage, which brings down the average productivity of surviving workers.

$$l_t \;=\; \phi_t^{1/\rho}\psi[1 - T + T\phi_t^{1/\rho}\psi]^{-1}$$

where, assuming $\iota < \theta/2$*, we obtain:* $\phi_t^{1/\rho}\psi < 1$*.*

Proof. Using corollary 7 to substitute in $U_t = U_n$, we obtain $l_t/l_n = \phi_t^{1/\rho}\psi$. Taking the labor market equilibrium condition: $(1-T)l_n + Tl_t = 1$, we can solve for l_n. Now, take: $\iota < \theta/2$: for case c, it is clear that $\phi_t^{1/\rho}\psi < 1$; for cases a and b, since the expression is increasing in ι, taking the upper bound of ι, we obtain that $\phi_t^{1/\rho}\psi < 1$. ■

4 Foreign Competition and the Expansion of International Trade

The expansion of international trade, arising from a reduction in transportation costs or trade barriers, has increasingly exposed industries to foreign competition. This section addresses the labor market consequences of opening up a non-traded industry. We start by focusing on the consequences for the industry itself (i.e. the short run), and then look at the implications for the economy as a whole (i.e. the long run). Finally, we address the case of heterogeneity in educational attainment.

4.1 Industry effects

Assume that industry j^o, previously non-traded, is now open to foreign competition. Taking as given the labor supply in the industry: $l_{j^o} = l_n$, the short run consequences for wage contracts in industry j^o depend on the parameter configuration (ρ, θ, ι), as discussed in lemma 2. Foreign competition increases the volatility of nominal productivity, which reduces the welfare of workers, by creating bankruptcy risk. This can be partially or totally hedged by risk-averse workers through a lower wage, creating the potential for profits to employers (in the case of labor rationing). In sum,

Corollary 4 *If* $l_n = l_t$*, as an industry becomes open to foreign competition, the welfare of workers in the industry falls. Moreover, either the contract wage declines, as the expected profits of employers increase, or the survival probability diminishes, or both.*[12]

Proof. The results are immediate from lemma 2. ■

[12] Hamermesh (1991) shows that "shocks that increase the probability of displacement

4.2 Economy-Wide effects

Next, we address the economy wide (long run) implications of the increase in openness. We do so by looking, in turn, at the effects on volatility, job-instability, real wages and welfare of an increase in T.

In terms of employment, the decline in the welfare of workers in industry j^o, depicted in corollary 4, leads to a reallocation which increases employment in other industries. Hence we obtain:

Corollary 5 *An increase in T increases l_t and l_n, expanding the share of labor in the tradable sector (Tl_t).*

Proof. From remark 1, $(1-T)l_n$ and Tl_t denote the share of labor in the non-tradable and tradable sector, respectively. The rest is obvious from lemma 3. ■

4.2.1 Volatility and Instability

To address the implications for wage volatility and job-instability, we start by obtaining measures that capture these phenomena, and then look at the consequences of an increase in T.

We overcome the static nature of the model, by taking a succession of its equilibria to capture the time-series path of the variables. In the non-tradable sector, workers get wage w_n/P and remain in the same job every period. In the tradable sector, a worker receives w_t/P with probability ϕ_t, and has to change jobs (given the bankruptcy of her employer) with probability $1-\phi_t$. Hence we obtain:

Lemma 6 *Let $\bar{\phi} \equiv Tl_t(1-\phi_t)+(1-T)l_n(1-\phi_n)$ define the mean separation rate; while $\bar{\sigma}_w \equiv Tl_t\sigma_t + (1-T)l_n\sigma_n$ is the mean coefficient of variation of wage. Then, they are given respectively by*

$$\bar{\phi} = \frac{(1-\phi_t)}{1+(T^{-1}-1)\phi_t^{-1/\rho}\psi^{-1}} \quad , \qquad \bar{\sigma}_w = \frac{(\phi_t^{-1}-1)^{1/2}}{1+(T^{-1}-1)\phi_t^{-1/\rho}\psi^{-1}}$$

also significantly reduce the wage increase". (...) a 1% wage decrease is associated with a 1.5% increase in the probability the plant closes. We assume that $l_n = l_t$ to focus on volatility effects, and ignore terms of trade effects related to differences between p_t and $E(p_{j^o})$.

Proof. The expected value and the variance of the wage of a worker with a contract setting ϕ_j and w_j can be written, respectively, as: $\phi_j w_j$ and $(1-\phi_j)\phi_j w_j^2$, hence yielding: $\sigma_j = (\phi_j^{-1}-1)^{1/2}$. Taking lemma 3 to substitute for l_n and using $\phi_n = 1$ completes the proof. ■

The mean separation rate, depicting the probability that a randomly chosen worker separates in a given period, captures the extent of job instability, while the mean coefficient of variation of wage depicts wage volatility. It should be noted that $\bar{\phi}$ denotes also the frictional unemployment rate, while $\bar{\sigma}_w$ reflects the time-series volatility of the individual wage.

Now, since, in the tradable sector, wages are more volatile and bankruptcy probability higher, its expansion, from an increase in foreign competition (see lemma 5), has a straightforward compositional effect on the job-instability and wage-volatility of the representative worker, as shown below:

Corollary 7 *Under bankruptcy risk equilibria (see table 1), an increase in T expands the mean separation rate, i.e. the frictional unemployment rate ($\bar{\phi}$), and the mean coefficient of variation of wage ($\bar{\sigma}_w$).*

Proof. Obvious from lemmas 3 and 6. ■

4.2.2 Wages, Welfare and Income Distribution

We start this section by analyzing the equilibrium in the model, comparing the features of tradable and non-tradable industries. Afterwards we analyze the impact of an increase in openness on income distribution, and on real wages and the welfare of workers.

Looking at the relative wages and productivity in the two sectors, a corollary from lemmas 2 and 3 is:

Corollary 8 *In equilibrium, the relative contract wage and the relative expected wage, in tradables, are given, respectively, by:*

$$w_t/w_n = \phi_t^{-1/\rho} \geq 1$$
$$E(w_t)/E(w_n) = \phi_t^{1-1/\rho} \geq 1$$

Moreover, letting $\tilde{V}_j$ denote a worker´s nominal productivity in industry j net of bankruptcy costs, with V_j denoting the gross nominal productivity, we obtain, under bankruptcy risk equilibria (regions a and b - see table 1):

$$\underbrace{E(V_{j\leq T}) \geq E(\tilde{V}_{j\leq T}) \geq E(w_t)}_{tradables} \geq \underbrace{E(w_n) = E(\tilde{V}_{j>T}) = E(V_{j>T})}_{non\text{-}tradables}$$

Proof. $w_t/w_n = \phi_t^{-1/\rho}$ is immediate from lemmas 2 and 3; while: $E(w_t) = \phi_t w_t = \phi_t^{1-1/\rho} w_n$; where $\rho < 1 \Rightarrow \phi_t^{1-1/\rho} \geq 1$. From lemma 2, the expected net nominal productivity in non-tradable industry j can be written: $E(\tilde{V}_{j>T}) = \int p_j A_j = l_n^{-1} = w_n$, while in tradable industry j' we have: $E(\tilde{V}_{j\leq T}) \equiv \int_{\pi \geq -\iota \tilde{w}} p_t A_j (\theta\mu)^{-1} = \frac{1+\theta/2+\psi(1-\iota)}{2} \phi_t l_t^{-1} = \frac{1+\theta/2+\psi(1-\iota)}{2\psi} E(w_t)$, where $\psi \leq \frac{1+\theta/2}{1+\iota} \Rightarrow \frac{1+\theta/2+\psi(1-\iota)}{2\psi} \geq 1$ (see lemma 2). Finally the gross nominal productivity can be written as: $E(V_{j\leq T}) \equiv \int p_t A_j (\theta\mu)^{-1} = l_t^{-1} = \frac{2\theta}{(1+\theta/2)^2 - (\psi(1-\iota))^2} E(\tilde{V}_{j\leq T})$, where $\psi \geq \frac{1-\theta/2}{1-\iota} \Rightarrow \frac{2\theta}{(1+\theta/2)^2-(\psi(1-\iota))^2} \geq 1$. ■

The corollary has some noteworthy implications. First, there is a wage premium in the tradable sector, i.e. the expected wage is higher. This premium corresponds to a risk compensating differential, given the higher bankruptcy risk in the tradable sector. Note that it disappears when workers are risk neutral or contracts provide full insurance. Along with the wage-volatility captured in the mean coefficient of variation of wages (see lemma 6), the wage-premium contributes to the cross-sectional dispersion of wages.

Second, there is also a productivity premium in tradables. In equilibrium, the productivity in tradables is higher for three reasons: first, to finance bankruptcy costs; second, to pay the employer his profit, under labor rationing; and third, to cover the risk-compensating wage-premium. Together, these three reasons imply that the expected nominal productivity has to be higher than in non-tradables.

Now, given the surplus captured by employers in the tradable sector, under labor-rationing equilibria, the expansion of employment in that sector allows employers to grab increasingly larger profits, to the detriment of workers, who see their share in domestic income fall.

Corollary 9 *Under labor rationing equilibria (regions a and c - see table 1), an increase in T increases the share of profits in domestic income.*

Proof. From lemma 2, the share of profits on domestic income can be written: $Tl_t E(\pi_t)[Tl_t E(\pi_t) + (1-T)l_n w_n + Tl_t \phi_t w_t]^{-1} = \phi\varphi/2[\phi\varphi/2 + (1/T - 1 + \phi_t \psi)]^{-1}$, which is increasing in T. ■

Finally, we address the implications for the level of real wages and the welfare of workers, in equilibrium. We will show that, under certain conditions, there is a decline in the expected real wage, while welfare falls, under even less stringent conditions. Before, however, we must obtain the price index P (i.e. the CPI), as a corollary to lemma 3

Corollary 10 *The expressions for the CPI, and its derivative with respect to T, are given by:*

$$
\begin{aligned}
-\ln P &\simeq T\ln\phi_t^{1/\rho}\psi + (T-1)\theta^2/24 + \ln\mu + \ln l_n \\
\frac{\partial}{\partial T} - \ln P &\simeq \Delta_P + \theta^2/24
\end{aligned}
$$

where $\Delta_P = \ln\phi_t^{1/\rho}\psi - \frac{\phi_t^{1/\rho}\psi - 1}{1-T+T\phi_t^{1/\rho}\psi} < 0$

Proof. Applying the law of large numbers to P in (7), yields: $-\ln P = T\ln\mu + (1-T)E\ln A_j + \ln l_t^T l_n^{1-T}$. Taking a second order Taylor approximation to $E\ln A_j$, yields: $E\ln A_j = \ln\mu - \theta^2/24$; while, from lemma 3 we have $l_t/l_n = \phi_t^{1/\rho}\psi$. That $\Delta < 0$, can be obtained by simulation, for $0 < \phi_t^{1/\rho}\psi < 1$ and $0 < T < 1$. ■

Given that we chose as numeraire the economy´s aggregate output (gross of bankruptcy costs), P^{-1} captures the gross real output in the economy. The corollary thus shows that there are two conflicting effects of the increase in openness on gross output. First, there is a positive effect (given by $\theta^2/24$), which we address as the gains from trade, capturing the increased ability to smooth the consumption basket through international trade. The negative effect (given by Δ_P) captures the rise in the loss associated with the sub-allocation of workers to tradables, depicted by the productivity premium in that sector (see corollary 8). An increase in openness magnifies this sub-optimality, rendering the net effect on domestic output is ambiguous.

Let us then look at the implications for the representative worker. We start by establishing her expected real wage and welfare.

Lemma 11 *The representative worker's welfare (U) and expected real wage ($\bar{w}/P$, where $\bar{w} \equiv (1-T)l_n w_n\phi_n + Tl_t w_t\phi_t$) are given, respectively, by*

$$
\begin{aligned}
U &= \frac{1}{\rho}\left(\frac{w_n}{P}\right)^\rho \\
\frac{\bar{w}}{P} &= \frac{1-T+T\phi_t\psi}{1-T+T\phi_t^{1/\rho}\psi}\frac{w_n}{P}
\end{aligned}
$$

with w_n/P denoting the real wage in non-tradables, given by

$$
\ln(w_n/P) \simeq T\ln\phi_t^{1/\rho}\psi + (T-1)\theta^2/24 + \ln\mu
$$

Proof. From lemma 2: $\ln(w_n/P) = -\ln l_n - \ln P$. For $\bar{w}$: $(1-T)l_n w_n \phi_n + Tl_t w_t \phi_t = [(1-T)l_n + Tl_t\phi_t w_t/w_n]w_n$. Then, use lemmas 3 and 8 to obtain $Tl_t = \frac{T\phi_t^{1/\rho}\psi}{1-T+T\phi_t^{1/\rho}\psi}$ and $\phi_t w_t/w_n = \phi_t^{1-1/\rho}$, respectively. ■

Letting α and ∇ denote, respectively, the share of profits in domestic income and the share of gross domestic output (i.e. P^{-1}) lost to bankruptcy costs, the representative worker´s real wage can be re-written as: $\bar{w}/P = (1-\alpha)(1-\nabla)P^{-1}$, where $(1-\nabla)P^{-1}$ is real domestic income (output net of bankruptcy costs). Straightforward manipulation yields that

$$\nabla = Tl_t \int_{\pi_j < -\iota w_t} p_t A_j = T(1-\phi_t)\frac{(1-\iota)\psi + (1-\theta/2)}{2} \tag{9}$$

increases with T, in the case of bankruptcy risk equilibria (see table 1).

The impact of an increase in openness on the real wage has several components. On one hand, as discussed in corollary 10, gross domestic output has an ambiguous shift, i.e. an ambiguous effect on the wage. On the other, two additional forces work to lower the real wage: the increase in the proportion of output lost to bankruptcy costs (∇), under bankruptcy risk equilibria, and the expansion of the share of profits (α), under labor rationing equilibria (see corollary 9). Hence, the expected real wage of the representative worker falls, unless the gains from trade outweigh all other effects compounded.

Moreover, due to the increase in the volatility of the wage addressed in lemma 7, the welfare of the representative worker may decline, even if her expected wage increases, implying that the conditions for a decline in welfare are less stringent, i.e. more likely, than those for a decline in the expected wage.

In sum, we obtain

Corollary 12 *An increase in T reduces the ex-ante welfare of the representative worker when*

$$|\ln \phi_t^{1/\rho}\psi| > \theta^2/24$$

while the wage of the representative worker falls when

$$|\ln \phi_t^{1/\rho}\psi| > \theta^2/24 + \Delta_w$$

with $\Delta_w \equiv \frac{\psi(\phi_t - \phi_t^{1/\rho})}{(1-T+T\phi_t\psi)\left(1-T+T\phi_t^{1/\rho}\psi\right)} \geq 0.$

Proof. See lemma 11. To show that $\Delta_w \geq 0$, note that $\phi_t < 1$ iff $\rho > 0$. ■

To conclude, it should be mentioned that our measure for the wage of the representative worker is more inclusive than the standard measure in labor statistics, the average wage, which ignores unemployed workers. In terms of the average wage, defined as the mean wage of employed workers, the most common wage indicator, we have:

Corollary 13 *Letting* $\tilde{w} \equiv \bar{w}\left((1-T)l_n\phi_n + Tl_t\phi_t\right)^{-1}$ *denote the average wage. An increase in* T *reduces* $\tilde{w}/P$ *when*

$$|\ln \phi_t^{1/\rho}\psi| > \theta^2/24 + \Delta_w + \Delta_u$$

where $\Delta_u = \frac{(1-\phi)\phi^{1/\rho}\psi}{\left(1-T+T\phi^{1+1/\rho}\psi\right)\left(1-T+T\phi^{1/\rho}\psi\right)} \geq 0.$

Proof. Now, $(1-T)l_n\phi_n + Tl_t\phi_t = 1 - Tl_t(1-\phi_t) = \frac{1-T+T\phi^{1+1/\rho}\psi}{1-T+T\phi^{1/\rho}\psi}$ (see lemma 3). The result is immediate from corollary 12 and taking $\Delta_u \equiv -\frac{d}{dT}\ln\frac{1-T+T\phi^{1+1/\rho}\psi}{1-T+T\phi^{1/\rho}\psi}$ ■

The Δ_u component of the change in the average wage arises because, by expanding bankruptcies, the increase in openness selects high productivity workers to the wage statistics. With low productivity workers unemployed, the average wage increases, without a corresponding effect on welfare. Hence the average wage is not a sufficient statistic for the effect of foreign competition on the welfare of workers; the expansion in frictional unemployment also contributes to a decline in the welfare of the representative worker.

4.3 The Wage Skill Gap

This section digresses from our core set-up by taking into account the heterogeneity in the skills of workers. It addresses the role of education in the response to an increase in foreign competition. In particular, the model predicts an increase in the relative insecurity and the relative wage for skilled workers.

We take it that mobility costs decline with education.[13] In the model, we capture this by assuming that skilled workers are less averse to bankruptcy

[13]Education lowers mobility costs for several reasons. First, from an informational perspective, it improves the ability to assess market conditions and track down opportunities. Second, it provides general human capital, transferrable across sectors, whereas the human capital of those with lower education is bound to be specific to the firm or industry

risk, i.e. that ρ is higher for skilled workers ($\rho_s > \rho_u$). In this context, we look at the partial equilibrium effects of opening industry j^o to foreign competition, assuming employment (of skilled and unskilled workers) in the industry remains unchanged.

To begin, we compare the equilibria for skilled and unskilled workers. In a non-tradable industry, since the contract is independent of risk aversion, skilled and unskilled workers have a risk-less contract paying the expected value of their nominal productivity (see lemma 2). By contrast, in tradable industries, the equilibrium contract depends on the risk aversion parameter, ρ, as shown below:

Corollary 14 *In a non-tradable industry, the survival probability (ϕ_j) and the contract wage (w_j) are independent of ρ. By contrast, in a tradable industry j, given l_j, an increase in ρ reduces the survival probability (ϕ_j) and expands the contract wage (w_j).*

Proof. The result for non-tradables, is immediate from lemma 2. The lemma also shows that the impact on w_j is captured by ψ_j.Now, given the expressions for ϕ_j and ψ_j in lemma 2, they are affected by an increase in ρ if we are within region a, or if it leads to a transition from regions: c to a; c to b; and a to b. Algebraic manipulation of the different expressions shows that an increase in ρ increases ψ_j and reduces ϕ_j. ■

Hence the consequences of the openness of an industry to foreign competition depend on the risk aversion of workers. Given our assumption that risk aversion is a proxy for educational attainment, the argument implies that the opening up of the industry has different ramifications for skilled and unskilled workers. In particular, the contract chosen by skilled workers under openness, entails a higher wage and a lower survival probability. Hence we obtain:

Corollary 15 *The openness of industry j^o to foreign competition, given l_{j^o}, increases the relative bankruptcy risk (i.e. job insecurity) for skilled workers and the wage-skill gap in the industry.*

Proof. The relative bankruptcy risk is given by $(1-\phi_{j^o}(\rho_s))/(1-\phi_{j^o}(\rho_u))$, while the wage skill gap is given by $w_{j^o}(\rho_s)/w_{j^o}(\rho_u)$. When the industry

(Grossman and Shapiro, 1982, - see Carrington (1993) and Neal (1995) for evidence of industry- and location-specific human capital). Third, it facilitates geographical mobility (Pissarides and Wadsworth, 1989; Mauro and Spilimbergo, 1998).

is non-traded, we obtain $\phi_{j^o}(\rho_s)/\phi_{j^o}(\rho_u) = w_{j^o}(\rho_s)/w_{j^o}(\rho_u) = 1$. Now, in the case of tradable, corollary 14 implies that $\phi_{j^o}(\rho_s)/\phi_{j^o}(\rho_u) < 1$ and $w_{j^o}(\rho_s)/w_{j^o}(\rho_u) > 1$. ■

Although addressing the full general equilibrium implications of the asymmetry between skilled and unskilled workers is beyond our scope, the predictions obtained are in line with the empirical evidence. Indeed, the results suggest that the increase in a skilled worker´s (a) relative job insecurity and (b) relative wage over the last two decades (documented in Aaronson and Sullivan, 1999 and Slaughter and Swagel, 1997, respectively) capture the influence of education (i.e. risk-aversion) in affecting the response to an increase in volatility, caused here by the expansion of foreign competition.

5 Conclusion

This paper has addressed the effects of international trade on labor markets, through its role on volatility. We stress two points. First, that international trade and foreign competition have implications for the volatility of a firm´s profitability. Second, that the volatility of profitability has implications for labor markets, in the absence of perfect risk markets.

Following Bhagwati (1998), we have addressed the first argument as *kaleidoscopic comparative advantage.* We have assumed here that it is due to the independence of prices from productivity shocks, under foreign competition. However, other reasons are the volatility of world prices or of the exchange rate.

Regarding the second argument, our main interest have been the consequences for wages and the welfare of workers, in a world where, due to borrowing constraints, the volatility of profitability may lead to bankruptcy.

An important result is that, due to *kaleidoscopic comparative advantage,* contracts in tradable industries yield a higher bankruptcy probability and the possibility of profits for employers, despite free-entry. Profits occur due to labor rationing, since workers are unwilling to move to employers paying a higher wage, due to the higher probability of bankruptcy.

Looking at the consequences of an industry´s increased exposure to trade, we have shown that the increase in the volatility of profitability raises the probability of bankruptcy rise and/or the profits of employers, and lowers the welfare of workers. In the long run, it contributes to a generalized decline in real wages and the welfare of workers, an increase in job insecurity and wage volatility. Addressing the educational heterogeneity of workers, our results suggest also an increase in the wage-skill gap and an increase in the relative insecurity for skilled workers.

The main contribution of this paper is to show that not only the expansion of trade with developing countries, but virtually all types of international trade, may add to the woes of workers and labor markets. It´s goal is to stress that the low significance of Stolper-Samuelson effects of trade with developing countries, does not exhaust the interaction between international trade and labor markets.

Finally, for the sake of clarity, this paper has ignored many of the sources of gains from trade. Considering these gains might outweigh some of the results obtained here regarding the effects of international competition.

6 Appendix

In this appendix, we look at whether workers will choose the optimal contract, when the wage volatility of ex-post spot markets is an alternative. If a worker decides to go on the spot market, her wage is given by nominal productivity, and her welfare by $U_s = E(V_j/P)^\rho$. Given lemma 2 the participation constraint for workers is satisfied, when:

$$\frac{1}{\rho}E(V_j/P)^\rho \leq \frac{1}{\rho}\phi(w_j)(w_j/P)^\rho \tag{10}$$

The proposition below shows that, as long as borrowing constraints are not too severe, such that bankruptcy risk is no too high, workers will prefer the contract to the spot wage.

Proposition 16 *In a non-tradable industry, a worker is indifferent between the contract or the spot-market. In a tradable industry, the participation constraint is satisfied (and all workers take the contract), when* $\iota \geq \hat{\iota}$*, where*

$$\hat{\iota} = \begin{cases} 1-(1-\theta/2)\left[\frac{(1+\rho)\theta}{(1+\theta/2)^{1+\rho}-(1-\theta/2)^{1+\rho}}\right]^{1/\rho} & \text{if } \rho \leq \theta^{-1}-1/2 \\ 1-\frac{\rho}{1+\rho}\left(1-\left(\frac{1-\theta/2}{1+\theta/2}\right)^{1+\rho}\right)^{-1/\rho} & \text{if } (2\rho+1)^{-1} < \theta/2 \leq \Omega(\rho) \\ \iota_o \text{ with: } \frac{2\iota_o(1+\rho)}{(1+\iota_o)^{1+\rho}} = 1-\left(\frac{1-\theta/2}{1+\theta/2}\right)^{1+\rho} & \text{if } \Omega(\rho) < \theta/2 \leq 1 \end{cases}$$

with $\Omega(\rho) \equiv \frac{1-\left(1-\left(\frac{\rho+1/2}{\rho+1}\right)^\rho\right)^{\frac{1}{1+\rho}}}{1+\left(1-\left(\frac{\rho+1/2}{\rho+1}\right)^\rho\right)^{\frac{1}{1+\rho}}} > (2\rho+1)^{-1}$*, where* $\hat{\iota} < \theta/2$

Proof. From lemma (2): in the non-tradable industry, the optimal contract is identical to the spot market equilibrium; in tradables, we can rewrite (10) as: $E(A_j^\rho)/\mu^\rho \leq \phi\psi^\rho$, where from (2), we obtain:

$$\frac{E\left(A_j^\rho\right)}{\mu^\rho} = \frac{(1+\theta/2)^{1+\rho} - (1-\theta/2)^{1+\rho}}{(1+\rho)\theta} < 1$$

A numerical computation of the values of $\hat{\imath}$, shows that $\hat{\imath} \leq \theta/2$. ■

7 References

Aaronson, D. and D. Sullivan (1998) “The Decline of Job Security in the 1990´s: Displacement, Anxiety and their effect on Wage Growth” Economic Perspectives, Federal reserve Bank of Chicago

Abowd, J. and O. Ashenfelter (1981) “Anticipated Unemployment, Temporary Layoffs, and Compensating Wage Differentials” in Studies in Labor Markets, S. Rosen ed. NBER, University of Chicago Press.

Bernard, A. and Jensen, J. (1995): “Exporters, Jobs, and Wages in U.S. Manufacturing: 1976-1987” Brookings-Papers-on-Economic-Activity; 0(0), Microeconomics 1995.

Bertrand, M. (1999) “From the Invisible Handshake to the Invisible Hand? How Import Competition Changes the Employment Relationship” NBER Working Paper 6900

Bhagwati, J. (1998): ‘A New Epoch’; ch. 1 in *A Stream of Windows*, MIT Press, 1998, Cambridge.

Bosworth, B and G. Perry (1994) “Productivity and Real Wages. Is There a Puzzle?” Brookings Papers on Economic Activity 1: 317-44. Washington: Brookings Institution

Cline, W. (1997) ”Trade and Income Distribution”, Institute of International Economics, Washington, DC.

Gottschalk, P. and R. Moffit (1994): ‘The Growth of Earnings Instability in the U.S. Labor Market’ Brookings Papers on Economic Activity 2, 1994, Brookings Institution,Washington, DC.

Gottschalk, P. (1997): ‘Inequality, Income growth and Mobility: the Basic Facts’, Journal of Economic Perspectives, Spring, 1997, vol. 11, n 2

Gourinchas, P. (1998): ‘Exchange Rates and Jobs: What Do We Learn From Job Flows?’ mimeo, Princeton University, 1998

Greenspan, Alan (1997): “Monetary policy” - testimony and report before the U.S. House Committee on Banking, Housing and Urban Affairs, 104th Congress, 1st session, February 26, 1997.

Hall, R. (1995) ‘Lost Jobs’ Brookings papers on Economic Activity, 1: 1995

Hamermesh, D. (1991) “Wage Concessions, Plant Shutdowns, and the Demand for Labor” in Job Displacement, J. Addison ed., Wayne State University Press

Judd, K. (1985): ‘The Law of Large Numbers with a Continuum of IID Random Variables’, Journal of Economic Theory; 35(1), February 1985

Katz, L. and K: Murphy (1992) ”Changes in Relative Wages, 1963-87: Supply and Demand Factors” Quarterly Journal Economics 107, n.428 (February): 35-78.

Katz, L. and A. Krueger (1999) “The High-Pressure US Labour Market in the 1990´s” Brookings Papers on Economic Activity 1: 1-88. Washington: Brookings Institution

Mishel, L. and J. Bernstein (1994) “The State of Working America: 1994-95”. Washington, Economic Policy Institute

Parson, D. (1986) “The Employment Relationship: Job Attachement, Work Effort, And the Nature of Contracts” Handbook of Labor Economics, Vol II; O. Ashenfelter and R. Layard eds; Elsevier Science Publishers

Rodrik, D. (1997): *Has Globalization Gone Too Far*, Institute for International Economics, 1997, Washington, DC

Rodrik, D. (1998) “The Debate over Globalization. How to Move Forward by Looking Backward” Paper prepared for a conference on the future of the World Trading System, Institute of International Economics, Washington, DC.(May)

Schmidt, S. and C. Thompson (1997) “Have Workers´Beliefs About Job Security Been Keeping Wage Inflation Low? Evidence From Public Opinion Data” Milken Institute working paper

Williamson, S. (1986) “Costly Monitoring, Financial Intermediation and Equilibrium Credit Rationing” Journal of Monetary Economics; 18 (2) September

WORKING PAPERS

1/90 PRODUTO POTENCIAL, DESEMPREGO E INFLAÇÃO EM PORTUGAL
Um estudo para o período 1974-1989
— Carlos Robalo Marques

2/90 INFLAÇÃO EM PORTUGAL
Um estudo econométrico para o período 1965-1989, com projecções para 1990 e 1991
— Carlos Robalo Marques

3/92 THE EFFECTS OF LIQUIDITY CONSTRAINTS ON CONSUMPTION BEHAVIOUR
The Portuguese Experience
— Sílvia Luz

4/92 LOW FREQUENCY FILTERING AND REAL BUSINESS CYCLES
— Robert G. King, Sérgio T. Rebelo

5/92 GROWTH IN OPEN ECONOMIES
— Sérgio Rebelo

6/92 DYNAMIC OPTIMAL TAXATION IN SMALL OPEN ECONOMIES
— Isabel H. Correia

7/92 EXTERNAL DEBT AND ECONOMIC GROWTH
— Isabel H. Correia

8/92 BUSINESS CYCLES FROM 1850 TO 1950: NEW FACTS ABOUT OLD DATA
— Isabel H. Correia, João L. Neves, Sérgio Rebelo

9/92 LABOUR HOARDING AND THE BUSINESS CYCLE
— Craig Burnside, Martin Eichenbaum, Sérgio Rebelo

10/92 ANALYSIS OF FOREIGN DIRECT INVESTMENT FLOWS IN PORTUGAL USING PANEL DATA
— Luísa Farinha

11/92 INFLATION IN FIXED EXCHANGE RATE REGIMES:
THE RECENT PORTUGUESE EXPERIENCE
— Sérgio Rebelo

12/92 TERM STRUCTURE OF INTEREST RATES IN PORTUGAL
— Armindo Escalda

13/92 AUCTIONING INCENTIVE CONTRACTS: THE COMMON COST CASE
— Fernando Branco

14/92 INDEXED DEBT AND PRODUCTION EFFICIENCY
— António S. Mello, John Parsons

15/92 “TESTING” FOR MEAN AND VARIANCE BREAKS WITH DEPENDENT DATA
— José A. F. Machado

16/92 COINTEGRATION AND DYNAMIC SPECIFICATION
— Carlos Robalo Marques

17/92 FIRM GROWTH DURING INFANCY
— José Mata

18/92 THE DISTRIBUTION OF HOUSEHOLD INCOME AND EXPENDITURE IN PORTUGAL: 1980 and 1990
— Miguel Gouveia, José Tavares

19/92 THE DESIGN OF MULTIDIMENSIONAL AUCTIONS
— Fernando Branco

20/92 MARGINAL INCOME TAX RATES AND ECONOMIC GROWTH IN DEVELOPING COUNTRIES
— Sérgio Rebelo, William Easterly

21/92 THE EFFECT OF DEMAND AND TECHNOLOGICAL CONDITIONS ON THE LIFE EXPECTANCY OF NEW FIRMS
— José Mata, Pedro Portugal

22/92 TRANSITIONAL DYNAMICS AND ECONOMIC GROWTH IN THE NEOCLASSICAL MODEL
— Robert G. King, Sérgio Rebelo

23/92 AN INTEGRATED MODEL OF MULTINATIONAL FLEXIBILITY AND FINANCIAL HEDGING
— António S. Mello, Alexander J. Triantis

24/92 CHOOSING AN AGGREGATE FOR MONETARY POLICY: A COINTEGRATION APPROACH
— Carlos Robalo Marques, Margarida Catalão Lopes

25/92 INVESTMENT: CREDIT CONSTRAINTS, REGULATED INTEREST RATES AND EXPECTATIONS OF FINANCIAL LIBERALIZATION THE PORTUGUESE EXPERIENCE
— Koleman Strumpf

1/93 SUNK COSTS AND THE DYNAMICS OF ENTRY
— José Mata

2/93 POLICY, TECHNOLOGY ADOPTION AND GROWTH
— William Easterly, Robert King, Ross Levine, Sérgio Rebelo

3/93 OPTIMAL AUCTIONS OF A DIVISIBLE GOOD
— Fernando Branco

4/93 EXCHANGE RATE EXPECTATIONS IN INTERNATIONAL OLIGOLOPY
— Luís Cabral, António S. Mello

5/93 A MODEL OF BRANCHING WITH AN APPLICATION TO PORTUGUESE BANKING
— Luís Cabral, W. Robert Majure

6/93 HOW DOES NEW FIRM SURVIVAL VARY ACROSS INDUSTRIES AND TIME?
— José Mata, Pedro Portugal

7/93 DO NOISE TRADERS “CREATE THEIR OWN SPACE”?
— Ravi Bhushan, David P. Brown, António S. Mello

8/93 MARKET POWER MEASUREMENT – AN APPLICATION TO THE PORTUGUESE CREDIT MARKET
— Margarida Catalão Lopes

9/93 CURRENCY SUBSTITUTABILITY AS A SOURCE OF INFLATIONARY DISCIPLINE
— Pedro Teles

10/93 BUDGET IMPLICATIONS OF MONETARY COORDINATION IN THE EUROPEAN COMMUNITY
— Pedro Teles

11/93 THE DETERMINANTS OF FIRM START-UP SIZE
— José Mata

12/93 FIRM START-UP SIZE: A CONDITIONAL QUANTILE APPROACH
— José Mata, José A. F. Machado

13/93 FISCAL POLICY AND ECONOMIC GROWTH: AN EMPIRICAL INVESTIGATION
— William Easterly, Sérgio Rebelo

14/93 BETA ESTIMATION IN THE PORTUGUESE THIN STOCK MARKET
— Armindo Escalda

15/93 SHOULD CAPITAL INCOME BE TAXED IN THE STEADY STATE?
— Isabel H. Correia

16/93 BUSINESS CYCLES IN A SMALL OPEN ECONOMY
— Isabel H. Correia, João C. Neves, Sérgio Rebelo

17/93 OPTIMAL TAXATION AND CAPITAL MOBILITY
— Isabel H. Correia

18/93 A COMPOSITE COINCIDENT INDICATOR FOR THE PORTUGUESE ECONOMY
— Francisco Craveiro Dias

19/93 PORTUGUESE PRICES BEFORE 1947: INCONSISTENCY BETWEEN THE OBSERVED COST OF LIVING INDEX AND THE GDP PRICE ESTIMATION OF NUNES, MATA AND VALÉRIO (1989)
— Paulo Soares Esteves

20/93 EVOLUTION OF PORTUGUESE EXPORT MARKET SHARES (1981-91)
— Cristina Manteu, Ildeberta Abreu

1/94 PROCUREMENT FAVORITISM AND TECHNOLOGY ADOPTION
— Fernando Branco

2/94 WAGE RIGIDITY AND JOB MISMATCH IN EUROPE: SOME EVIDENCE
— Sílvia Luz, Maximiano Pinheiro

3/94 A CORRECTION OF THE CURRENT CONSUMPTION INDICATOR – AN APPLICATION OF THE INTERVENTION ANALYSIS APPROACH
— Renata Mesquita

4/94 PORTUGUESE GDP AND ITS DEFLATOR BEFORE 1947: A REVISION OF THE DATA PRODUCED BY NUNES, MATA AND VALÉRIO (1989)
— Carlos Robalo Marques, Paulo Soares Esteves

5/94 EXCHANGE RATE RISK IN THE EMS AFTER THE WIDENING OF THE BANDS IN AUGUST 1993
— Joaquim Pires Pina

6/94 FINANCIAL CONSTRAINTS AND FIRM POST-ENTRY PERFORMANCE
— Paulo Brito, António S. Mello

7/94 STRUCTURAL VAR ESTIMATION WITH EXOGENEITY RESTRICTIONS
— Francisco C. Dias, José A. F. Machado, Maximiano R. Pinheiro

8/94 TREASURY BILL AUCTIONS WITH UNINFORMED BIDDERS
— Fernando Branco

9/94 AUCTIONS OF SHARES WITH A SECONDARY MARKET AND TENDER OFFERS
— António S. Mello, John E. Parsons

10/94 MONEY AS AN INTERMEDIATE GOOD AND THE WELFARE COST OF THE INFLATION TAX
— Isabel Correia, Pedro Teles

11/94 THE STABILITY OF PORTUGUESE RISK MEASURES
— Armindo Escalda

1/95 THE SURVIVAL OF NEW PLANTS: START-UP CONDITIONS AND POST-ENTRY EVOLUTION
— José Mata, Pedro Portugal, Paulo Guimarães

2/95 MULTI-OBJECT AUCTIONS: ON THE USE OF COMBINATIONAL BIDS
— Fernando Branco

3/95 AN INDEX OF LEADING INDICATORS FOR THE PORTUGUESE ECONOMY
— Francisco Ferreira Gomes

4/95 IS THE FRIEDMAN RULE OPTIMAL WHEN MONEY IS AN INTERMEDIATE GOOD?
— Isabel Correia, Pedro Teles

5/95 HOW DO NEW FIRM STARTS VARY ACROSS INDUSTRIES AND OVER TIME?
— José Mata

6/95 PROCUREMENT FAVORITISM IN HIGH TECHNOLOGY
— Fernando Branco

7/95 MARKETS, ENTREPRENEURS AND THE SIZE OF NEW FIRMS
— José Mata

1/96 CONVERGENCE ACROSS EU COUNTRIES: INFLATION AND SAVINGS RATES ON PHYSICAL AND HUMAN CAPITAL
— Paulo Soares Esteves

2/96 THE OPTIMAL INFLATION TAX
— Isabel Correia, Pedro Teles

3/96 FISCAL RULES OF INCOME TRANSFORMATION
— Isabel H. Correia

4/96 ON THE EFFICIENCY AND EQUITY TRADE-OFF
— Isabel H. Correia

5/96 DISTRIBUTIONAL EFFECTS OF THE ELIMINATION OF CAPITAL TAXATION
— Isabel H. Correia

6/96 LOCAL DYNAMICS FOR SPHERICAL OPTIMAL CONTROL PROBLEMS
— Paulo Brito

7/96 A MONEY DEMAND FUNCTION FOR PORTUGAL
— João Sousa

8/96 COMPARATIVE EXPORT BEHAVIOUR OF FOREIGN AND DOMESTIC FIRMS IN PORTUGAL
— Sónia Cabral

9/96 PUBLIC CAPITAL ACCUMULATION AND PRIVATE SECTOR PERFORMANCE IN THE US
— Alfredo Marvão Pereira, Rafael Flores de Frutos

10/96 IMPORTED CAPITAL AND DOMESTIC GROWTH: A COMPARISON BETWEEN EAST ASIA AND LATIN AMERICA
— Ling-ling Huang, Alfredo Marvão Pereira

11/96 ON THE EFFECTS OF PUBLIC AND PRIVATE R&D
— Robert B. Archibald, Alfredo Marvão Pereira

12/96 EXPORT GROWTH AND DOMESTIC PERFORMANCE
— Alfredo Marvão Pereira, Zhenhui Xu

13/96 INFRASTRUCTURES AND PRIVATE SECTOR PERFORMANCE IN SPAIN
— Alfredo Marvão Pereira, Oriol Roca Sagales

14/96 PUBLIC INVESTMENT AND PRIVATE SECTOR PERFORMANCE: INTERNATIONAL EVIDENCE
— Alfredo Marvão Pereira, Norman Morin

15/96 COMPETITION POLICY IN PORTUGAL
— Pedro P. Barros, José Mata

16/96 THE IMPACT OF FOREIGN DIRECT INVESTMENT IN THE PORTUGUESE ECONOMY
Luísa Farinha, José Mata

17/96 THE TERM STRUCTURE OF INTEREST RATES: A COMPARISON OF ALTERNATIVE ESTIMATION METHODS WITH AN APPLICATION TO PORTUGAL
— Nuno Cassola, Jorge Barros Luís

18/96 SHORT-AND LONG-TERM JOBLESSNESS: A SEMI-PARAMETRIC MODEL WITH TIME -VARYING EFFECTS
— Pedro Portugal, John T. Addison

19/96 SOME SPECIFICATION ISSUES IN UNEMPLOYMENT DURATION ANALYSIS
— Pedro Portugal, John T. Addison

20/96 SEQUENTIAL AUCTIONS WITH SYNERGIES: AN EXAMPLE
— Fernando Branco

21/96 HEDGING WINNER'S CURSE WITH MULTIPLE BIDS: EVIDENCE FROM THE PORTUGUESE TREASURY BILL AUCTION
— Michael B. Gordy

22/96 THE BRICKS OF AN EMPIRE 1415-1999: 585 YEARS OF PORTUGUESE EMIGRATION
— Stanley L. Engerman, João César das Neves

1/97 LOCAL DYNAMICS FOR PLANAR OPTIMAL CONTROL PROBLEMS: A COMPLETE CHARACTERIZATION
— Paulo Brito

2/97 INTERNATIONAL PORTFOLIO CHOICE
— Bernardino Adão, Nuno Ribeiro

3/97 UNEMPLOYMENT INSURANCE AND JOBLESSNESS: A DISCRETE DURATION MODEL WITH MULTIPLE DESTINATIONS
— Pedro Portugal, John T. Addison

4/97 THE TREASURY BILL MARKET IN PORTUGAL: INSTITUTIONAL ISSUES AND PROFIT MARGINS OF FINANCIAL INSTITUTIONS
— Bernardino Adão, Jorge Barros Luís

5/97 ECONOMETRIC MODELLING OF THE SHORT-TERM INTEREST RATE: AN APPLICATION TO PORTUGAL
— Nuno Cassola, João Nicolau, João Sousa

6/97 ESTIMATION OF THE NAIRU FOR THE PORTUGUESE ECONOMY
— Carlos Robalo Marques, Susana Botas

7/97 EXTRACTION OF INTEREST RATE DIFFERENTIALS IMPLICIT IN OPTIONS: THE CASE OF SPAIN AND ITALY IN THE EUROPEAN MONETARY UNION
— Bernardino Adão, Jorge Barros Luís

1/98 A COMPARATIVE STUDY OF THE PORTUGUESE AND SPANISH LABOUR MARKETS
— Olympia Bover, Pilar García-Perea, Pedro Portugal

2/98 EARNING FUNCTIONS IN PORTUGAL 1982-1994: EVIDENCE FROM QUANTILE REGRESSIONS
— José A. F. Machado, José Mata

3/98 WHAT HIDES BEHIND AN UNEMPLOYMENT RATE: COMPARING PORTUGUESE AND US UNEMPLOYMENT
— Olivier Blanchard, Pedro Portugal

4/98 UNEMPLOYMENT INSURANCE AND JOBLESSNESS IN PORTUGAL
— Pedro Portugal, John T. Addison

5/98 EMU, EXCHANGE RATE VOLATILITY AND BID-ASK SPREADS
— Nuno Cassola, Carlos Santos

6/98 CONSUMER EXPENDITURE AND COINTEGRATION
— Carlos Robalo Marques, Pedro Duarte Neves

7/98 ON THE TIME-VARYING EFFECTS OF UNEMPLOYMENT INSURANCE ON JOBLESSNESS
— John T. Addison, Pedro Portugal

8/98 JOB SEARCH METHODS AND OUTCOMES
— John T. Addison, Pedro Portugal

1/99 PRICE STABILITY AND INTERMEDIATE TARGETS FOR MONETARY POLICY
— Vítor Gaspar, Ildeberta Abreu

2/99 THE OPTIMAL MIX OF TAXES ON MONEY, CONSUMPTION AND INCOME
— Fiorella De Fiore, Pedro Teles

3/99 OPTIMAL EXECUTIVE COMPENSATION: BONUS, GOLDEN PARACHUTES, STOCK OWNERSHIP AND STOCK OPTIONS
— Chongwoo Choe

4/99 SIMULATED LIKELIHOOD ESTIMATION OF NON-LINEAR DIFFUSION PROCESSES THROUGH NON-PARAMETRIC PROCEDURE WITH AN APPLICATION TO THE PORTUGUESE INTEREST RATE
— João Nicolau

5/99 IBERIAN FINANCIAL INTEGRATION
—Bernardino Adão

6/99 CLOSURE AND DIVESTITURE BY FOREIGN ENTRANTS: THE IMPACT OF ENTRY AND POST-ENTRY STRATEGIES
— José Mata, Pedro Portugal

1/00 UNEMPLOYMENT DURATION: COMPETING AND DEFECTIVE RISKS
— John T. Addison, Pedro Portugal

2/00 THE ESTIMATION OF RISK PREMIUM IMPLICIT IN OIL PRICES
— Jorge Barros Luís

3/00 EVALUATING CORE INFLATION INDICATORS
— Carlos Robalo Marques, Pedro Duarte Neves, Luís Morais Sarmento

4/00 LABOR MARKETS AND KALEIDOSCOPIC COMPARATIVE ADVANTAGE
— Daniel A. Traça