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JOB CREATION, JOB DESTRUCTION, AND THE INTERNATIONAL DIVISION OF LABOUR

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ABSTRACT

Job Creation, Job Destruction, and the International Division of Labour*

We incorporate equilibrium unemployment due to imperfect matching into a model of trade in intermediate inputs (Ethier (1982)). Firms are assumed to be price takers and their size is given by technology. Firms enter the market as long as expected profits cover the search cost they incur initially. Trade increases productivity in the final good and then demand for each intermediate input. Steady-state unemployment is reduced after trade integration because more vacancies are opened. When the rate of job destruction is made endogenous, international trade reduces the equilibrium rate of job destruction, and this induces an indirect positive effect on job creation. We also show that the more volatile environment faced by firms that is often associated with deeper trade integration is unlikely, *per se*, to increase unemployment.

JEL Classification: F16, J64
Keywords: job creation, job destruction, unemployment, international trade, increasing returns

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NON-TECHNICAL SUMMARY

Worsening economic conditions for unskilled workers in developed countries attract growing attention to the impact of trade on unemployment. In spite of 20 years of substantial innovation in trade theory, the workhorse model used to analyse the impact of trade on the labour market is still the traditional Heckscher-Ohlin-Samuelson (HOS) model. Traditional two-sector models allow for a stylized, though convenient representation of the consequences of increased North-South trade. However, when applied to explain employment consequences of increased trade between developed countries, these models have serious limitations. In HOS models it is assumed that countries import and export goods that belong to different industries (inter-industry trade). It is instead a well-established fact that an important and growing share of international trade is taking place within, rather than between sectors, especially among developed economies. HOS models would predict that the only way increased trade may affect unemployment is through labour reallocation between sectors. If labour displaced from the import-competing sector cannot be fully reabsorbed in other sectors (e.g. because of institutional rigidities), some workers will become unemployed as a result of increased trade integration. Recent empirical evidence however shows that the bulk of job reallocation in the US does not occur between sectors, but among firms and plants belonging to the same industry (Davis and Haltiwanger (1992)). Moreover, firm-level analysis shows that labour is displaced mostly within industries, rather than between industries, even in countries undergoing a period of trade liberalization (see Levinsohn (1996) for the case of Chile). This evidence raises the suspicion that the neo-classical trade model focuses on a trade–unemployment channel that may not be the most relevant from an empirical viewpoint. Finally, the assumption of constant returns to scale in production, which is at the centre of the traditional neo-classical HOS analysis, rules out the unemployment effects of trade that come from productivity changes and returns to scale exploitation. These effects are instead empirically relevant and are also likely to affect considerably the incentives that shape the equilibrium in the labour market.

The model we present in this Paper allows us to analyse the effect of trade on unemployment in a framework that takes into account the above mentioned stylized facts regarding intra-sectoral trade and intra-sectoral labour reallocation. Unemployment in our model results from frictions in the labour market that hamper the instantaneous meeting of supply and demand (we adopt a so-called ‘matching’ model). Labour market frictions are a within-industry phenomenon and this also accounts for trade-related unemployment when international trade basically consists of the exchange of goods belonging to same sectors. Matching models also have the advantage that they allow the effects of job creation and of job destruction on unemployment to be distinguished between. Greater openness to trade is likely to have an impact both on the rate at which new jobs are created and on the rate at which existing jobs are destroyed. Existing models, proposed to study the effects of trade on unemployment, do not allow for the identification of the different effects that international trade may have on job creation and job destruction. However, depending on the direction and on the relative importance of these two effects, the opening of trade may have different implications for labour market policies. In general, this distinction is crucial for a thorough assessment of the employment consequences and all the possible side effects of trade integration. It has been argued, for instance, that the rise in frictional unemployment which is observed in several developed countries can in part be attributed to trade via greater volatility in international prices (see e.g. Bhagwati and Dehejia (1994)). According to this view, as trade integration deepens, comparative advantages become more and more volatile, because even tiny price differences may start reversing trade patterns. As a result, as trade integration proceeds, job turnover is expected to accelerate and long-run unemployment to rise. This argument sounds plausible, but without a rigorous model of matching unemployment, there is the risk that this is just half of a possible story. Job creation and job destruction are interrelated phenomena: in studying the implications of trade on long-run unemployment, one cannot analyse them in isolation.

In our model, international trade takes place in intermediate goods that are produced out of labour. A final good is produced by means of the intermediate inputs; the higher the number of different varieties of intermediates, the higher the productivity in the final sector. Thus, productivity increases with the extent of the division of labour in the production of different intermediate goods (Ethier (1982)). We focus first on the effects of trade on job creation by assuming that job destruction is exogenous. Due to the existence of matching frictions in the labour market, it is costly for firms to create a vacancy and to look for a worker. The number of vacancies posted will therefore depend on the expected return of finding a worker, as this return has to cover at least the costs of searching for a worker. The return of filling a vacancy depends in turn on the productivity of the firm. An increase in trade thus puts in motion an entry process that produces a rise in open vacancies (more job creation) that will eventually lead to a lower rate of frictional unemployment. When the rate of job destruction is made endogenous through the assumption that firms are randomly destroyed due to idiosyncratic shocks, trade integration directly reduces job destruction. This is the case because the increase in productivity due to trade induces an entry process that raises firms' demand and then prices. This, in turn, allows firms to resist shocks of a greater magnitude. In this case, the effect of trade on job creation is only indirect. More vacancies will be opened in the steady state because firms will attach a higher value to a filled job due to its longer expected duration. Overall unemployment will be reduced as a consequence of reduced job destruction and increased job creation. Finally, we address the issue of trade-related volatility in price-cost margins. Deeper trade integration is often associated with a more uncertain environment for firms, volatile price-cost margins, and then higher job destruction. Our model allows us to evaluate the impact on steady-state unemployment of such an eventuality. It emerges that long-run unemployment hardly increases after trade even under the hypothesis that trade entails a mean-preserving upward jump in the variance of cost disturbances. Increased volatility in price-cost margins will increase the rate of job destruction, but would also unambiguously stimulate job-creation. The reason is that a larger dispersion of cost shocks would have first-order effects only on the left tail of the cost distribution concerning filled jobs, thus increasing their asset value.

Our analysis shows how the productivity effects associated with trade may be at odds with a common perception that growing world trade ('globalization') is responsible for greater labour turnover, job insecurity and then frictional unemployment. The prediction of our analysis is that, in the long run, enlarged trade possibilities are likely to lead to more job openings and also to longer job tenure. As for the implications for empirical analysis, our model suggests that important effects played by trade on the employment performance of the economies may not be reflected in **relative** price changes. Rather, the right direction for empirical research should be that of investigating those links that relate international trade to between-firms, within-industries job-relocation, a route that has been only recently explored (e.g. Levinsohn (1996)).

1 Introduction

The growing concern for the conditions of unskilled workers in developed countries has attracted increasing attention to the impact of trade on unemployment in recent times. In spite of twenty years of substantial innovation in trade theory, the workhorse model used to analyse the impact of trade on the labour market is still the neoclassical, Heckscher-Ohlin-Samuelson (HOS) model (e.g., Wood (1994), Krugman (1995)). Traditional two-sector models allow for a stylised, though convenient representation of the consequences of increased North-South trade.[1] However, when applied to explain employment consequences of increased trade between developed countries, these model have serious limitations. It is an established fact, for instance, that an important and growing share of international trade is taking place within, rather than between sectors. Models of the HOS are then likely to attach too much importance to the role of intersectoral labour reallocation. Recent empirical evidence (Davis and Haltiwanger (1992), Levinsohn (1996)) also shows that the bulk of job reallocation occurs between plants and within sectors, something that is at odds with the implications descending from traditional models for international trade. Moreover, the assumption of constant returns to scale in production, which is at the centre of the traditional neoclassical analysis, rules out the unemployment effects of trade that come from productivity changes and returns to scale exploitation. Yet, these effects are empirically relevant, and likely to affect considerably the incentives that shape the equilibrium in the labour market.

Greater openness to international trade has some impact both on the rate at which new jobs are created and on the rate at which existing jobs are destroyed. The models that have been proposed so far to study the effects of trade on unemployment do not allow for the identification of the different effects that international trade may have on job creation and job destruction. However, depending on the direction and on the relative importance of these two effects, the opening of trade may have different implications for labour market policies. A model of unemployment would then ideally allow to distinguish the transmission mechanisms that link international trade to both job creation and job destruction. Models with such features are the "matching" models developed by Diamond (1982), Pissarides (1990) and others, where unemployment is generated by frictions on the labour market that hamper the instantaneous meeting of supply and demand. Unemployment due to imperfect matching has already been incorporated into trade models (Davidson et al., 1988, 1991). The focus of the existing analyses, yet, is not

[1] Among the "first generation" of papers dealing with trade and unemployment in traditional two-sector models see, for instance, Brecher (1974, 1992), Matusz (1985) and Copeland (1989).

to investigate how trade may affect the extent and structure of unemployment, but rather to assess how the properties of traditional 2x2x2 general equilibrium trade models are affected by frictional unemployment. In spite of the increasing attention of the economic profession to "trade and jobs" issues, only very few of the arguments commonly advanced in the debate concern the effects of trade on "long-run" or "frictional" unemployment. Among the few, Bhagwati and Dehejia (1994) argue - without, however, developing a full-fledged model - that the rise in frictional unemployment which is observed in several developed countries can in part be attributed to trade via greater volatility in international prices. According to this view, as trade integration deepens, comparative advantages become fragile, volatile ("kaleidoscopic", in their terminology), because even tiny price differences may start reverting trade patterns. As a result, as trade integration proceeds, job turnover is expected to accelerate, and long-run unemployment to rise. This argument sounds sensible and intriguing. Though, without a rigorous model of matching unemployment, there is the risk that this is just half of a possible story. In studying the implications of trade on long-run unemployment, one cannot analyse in isolation the impact of trade on job destruction, without considering also the effects on job creation.

Our aim in this paper is to incorporate long-run unemployment due to imperfect matching into a model of international trade that captures some salient features of developed economies. International trade takes place in intermediate goods and is intra-industry. A final good is produced by means of intermediate inputs that are differentiated. The higher the number of different varieties of intermediates, the higher the productivity in the final sector. Inputs are produced out of labour. Thus, productivity increases with the extent of the division of labour in the production of different intermediate goods (Ethier (1982)). The production set-up we use is not new; it is close to that proposed by Ethier (1982), and adopted by Matusz (1996) to study trade and jobs issues. The main contribution of our work concerns the modeling of the labour market. In Matusz (1996) unemployment is the result of an efficiency wage story, in our model it is the consequence of imperfect matching. This allows us to derive endogenously the rate of job creation and the rate of job destruction, and to study the impact of the opening of trade on both. The mass of vacancies opened by searching firms is endogenous. Since search is a costly activity, welfare analysis of trade integration must then take into account the change in total output, net of search costs: a feature that distinguishes ours from previous models aimed at studying trade and employment issues. A further distinguishing feature of our analysis concerns the modeling of the industry. In contrast with conventional models of intra-industry trade where firms are monopolistically competitive, in our model firms producing intermediates are price takers and their size is given. Though entry is not restricted, active firms must earn positive profits. This because entrants, before starting production, have to search for workers, and search is costly and takes time.

Our main finding is that *international trade reduces long-run unemployment by both rising job creation and reducing job destruction.* Trade integration has a direct effect on job destruction because allows firms to resist to shocks of a greater magnitude, while the effect on job creation is only indirect. Moreover, our analysis shows that steady-state unemployment hardly increases as a result of trade even under the assumption that trade entails a mean-preserving upward jump in the variance of firms' shocks. Increased volatility in price-cost margins would increase the rate of job destruction, but would also unambiguously stimulate job-creation, thus having ambiguous effects on the unemployment rate.

The remainder of the paper is organized as follows. In section 2 we present the structure of the economy. In section 3 we characterise the autarchic equilibrium for the basic version of the model. In section 4 we compare equilibrium under autarchy and free trade, discussing the role of trade-induced volatility in firms' price-cost margins. The concluding remarks follow.

2 The Economy

We consider two countries, Home and Foreign, that are assumed to be symmetrical in all respects, except, possibly, their size. We are interested in comparing economic equilibrium for these countries under autarchy and free trade. Because of countries' symmetry, the description of the economy and the characterisation of the autarchic equilibrium (section 3) are restricted to Home.

The economy is characterised by increasing returns in production resulting from deeper specialisation of labour. Scale economies occur at an aggregate level and depend upon the size of the world market; in the words of Ethier (1982), the economy exhibits "international" returns to scale. The second feature that characterises the economy we want to model is the presence of frictions in the labour market that impede the instantaneous matching of supply and demand, thus leading to "equilibrium unemployment". We build a parsimonious model incorporating these ingredients. Increasing returns from labour specialisation are obtained through the use of a production function of the Spence-Dixit-Stiglitz (S-D-S) type, where productivity increases as more labour is used in the production of new varieties of intermediate inputs. The labour market is modelled, along the lines developed by Mortensen and Pissarides (1994), through the use of a "matching function", which gives the number of matches between searching firms and workers per unit of time as a function of the number of unemployed and vacant jobs. Jobs are destroyed because firms are hit by random shocks that affect their profitability: firms hit by sufficiently severe shocks may find it convenient to shut down operations and lay off workers.

Time is continuous, and we only characterise equilibrium in the steady state, abstracting from the effects of trade on adjustment dynamics. To simplify notation, the time index is omitted.

2.1 Production and demand

There is only one final good, Y. This good is chosen as the numeraire. The production of good Y only needs the use of intermediate inputs. Inputs can be produced along a continuum of possible varieties denoted by i, where $i \in R_+$. The production function for the final good is of the CES type

$$Y = \left(\int_0^n X(i)^\rho di \right)^{\frac{1}{\rho}}, \tag{1}$$

where $0<\rho<1$, $X(i)$ denotes the use (density) of input i and n is the number (mass) of different inputs used in the production of Y.

The production of one unit of each possible intermediate input i requires the use of one unit of labour. Firms supplying intermediate goods have also to pay non-labour costs $c(i)$ in each period, measured in terms of the numeraire. These costs are stochastic. Their realizations follow a stochastic process that will be described in detail in the next section.

In the economy there is a mass L of agents. Each agent is a potential worker. He (she) is endowed with one unit of labour, derives positive utility from consumption of the final good Y, and discounts future utility at the rate r.[2] We further assume risk neutrality and no disutility from effort. Each worker can be active and working, earning a wage $w(i)$ when employed in a firm producing variety i, or unemployed and searching. In each unit of time, individuals consume all their income.[3]

2.2 The labour market

While in the goods market (Y and $X(i)$) supply and demand meet instantaneously, the labour market is subject to frictions that hamper immediate matching between firms and workers. Since finding a job requires time and some jobs are destroyed in each period, a positive level of unemployment will be observed at the steady state. We assume, as is generally done in the literature dealing with matching frictions, that firms' technology is such that

[2] Individuals also hold a balanced portfolio of firms' assets valued on a perfect market, and receive each time a flow of dividends (firms' profits or losses).

[3] We do not restrict parameter values in such a way to exclude the possibility of negative consumption. Rather, following Marimon and Zilibotti (1997) we assume that positive consumption is guaranteed by an exogenous flow of the numeraire.

each firm just needs one worker to achieve production ("small firm assumption").[4] We further assume that each worker can perform in the production of at most one input variety. Production by each firm in the X sector thus concerns one input type only, and its output is given and equal to unity.[5] There is no on-the-job search, so that search and production are completely separate activities.

Matches between searching workers and firms occur randomly, at the Poisson rate $m(uL, vL)$, where u and v stand, respectively, for the fraction of unemployed workers and the number of searching firms as a percentage of the labour force. The function $m(.,.)$ is called the matching function. It summarizes the heterogeneity (geographical, technological, informational...) which is present across all possible firm-worker pairs. As usual, $m(.,.)$ is assumed to be a continuous, differentiable, homogenous of degree one function which satisfies Inada conditions.[6] By homogeneity, we can write

$$m(uL, vL) = vLq(\theta), \tag{2}$$

where $\theta \equiv v/u$ is a parameter denoting the "tightness" of the labour market. Thus, the average rate of matching per unit of time for a worker and a firm are, respectively, $\theta q(\theta)$ and $q(\theta)$. In the subsequent analysis the *rate of job creation* is thus given by $\theta q(\theta)$, namely, the rate at which unemployed workers are driven out of unemployment.[7]

As the labour market becomes tighter, it is easier for an unemployed to find a job, while firms must wait on average longer to fill their vacancies. It is easy to see how search in the labour market produces an *externality*: agents are not concerned about the effects of their decisions on others' probability of matching.

As for job destruction, it is generated endogenously by the stochastic process that governs the shocks that hit firms in the sector producing intermediate goods at each unit of time. Following Mortensen and Pissarides (1994), we assume that newly created firms (jobs) are more profitable than existing ones. This means assuming that the production of inputs of new type requires the lowest level of fixed costs. During the life of a firm, costs change according to a stochastic process. If these costs at time t are high, they may cause current losses; if they are high enough, current losses may be so high to lead to a negative expected discounted value of the firm. If

[4]The assumption that firms' size is given can be justified, for instance, on the ground of monitoring and coordination costs (see, e.g., Holmstrom and Tirole (1989)).

[5]The assumption that workers can manufacture at most one input variety can be relaxed without compromising results. It can be shown, for instance, that assuming input-specific search costs is sufficient to guarantee an equilibrium where each firm is not willing to supply more than one type of input. A proof is available from the authors upon request.

[6]Namely, $\lim_{u \to 0} m(.,.) = 0$, $\lim_{v \to 0} m(.,.) = 0$.

[7]Observe that $q'(\theta) < 0$, that the mean duration of unemployment is $1/\theta q(\theta)$ and that the elasticity of $q(\theta)$, η, is a number between 0 and -1.

this is the case, the firm at time t shuts down operations and lays off its worker: a job is destroyed. Since newly created goods are more profitable, in each period new goods are introduced and old goods disappear.

We assume hereafter that non-labour costs are expressed as $c+\sigma\varepsilon$: c and σ are common to all jobs; the term ε is job-specific[8]. Firms' costs change according to a Poisson process with arrival rate λ. New values of ε are drawn from a distribution $F(z)$, which has a finite lower support $\varepsilon_l > -\frac{c}{\sigma}$, and no mass points. Without loss of generality we assume that $F(z)$ has a zero mean and a unit variance, so that σ is the standard deviation of firms' shocks.

As it will be clear in the section, firms are destroyed whenever they are hit by a shock above an endogenously determined threshold ε_d. The *rate of job destruction* is therefore given by the rate at which shocks above the value ε_d arrive to each firm, namely, $\lambda\left[1-F(\varepsilon_d)\right]$.

3 Equilibrium under autarchy

The final good is produced in a perfectly competitive industry. Firms producing intermediate inputs are also price takers, because the output produced by each firm in the X sector is constant and equal to unity. Potential entrants in the intermediate sector decide at each time t whether or not enter the market. In doing that, they maximise the expected discounted flow of their profits (i.e., their asset value). If a firm decides to enter the market, it has to post a vacancy, and pay a search cost γ, measured in terms of the numeraire. Once firms are matched with a worker, they choose the input variety to supply. Filled jobs are hit by stochastic shocks. Incumbents thus have to decide at each time t whether to continue production or to shut down operations.

Concerning the entry decision, since firms' entry is not restricted, vacancies will be supplied until the gain from opening an additional vacancy is equal to the value of an idle firm, i.e., zero.

As for the choice of input varieties, note that from cost minimization in the final sector, demand for each possible intermediate input i is derived as

$$D(i) = Y\left(\int_0^n p(j)^{\frac{\rho}{\rho-1}}dj\right)^{\frac{\rho-1}{\rho}} p(i)^{\frac{1}{\rho-1}}. \tag{3}$$

From equality of supply (fixed to unity for each variety) and demand (as given in (3)) the price of input i is higher if not supplied by other firms. So, no firm producing intermediate goods will find it convenient to supply variants already supplied by others. Notice also that since there is no couple

[8] Since each firm is ex-ante symmetric we can avoid the use of an index for individual firms.

of firms supplying the same input, equality of supply (equal to unity for all varieties) and demand implies $p(i) = p$ for all i; i.e., perfect symmetry in prices.

Finally, concerning the exit decision – since no cost is sunk and the value of an idle firm is zero – firms will continue production until as long as their asset value is positive, which is the case if they are hit by sufficiently small shocks.

3.1 The final sector

Production of good Y occurs in perfectly competitive firms and is subject to constant returns to scale. Equality of price (normalized to unity) and marginal cost yields

$$1 = \left(\int_0^n p(j)^{\frac{\rho}{\rho-1}} dj \right)^{\frac{\rho-1}{\rho}} . \tag{4}$$

Using symmetry, the following relationship between p and n summarises equilibrium in the final sector

$$p = n^{\frac{1-\rho}{\rho}} . \tag{5}$$

The higher the number of different inputs used in the production of Y, the higher the price for intermediates which is compatible with the zero-profit condition in the final sector. When, at given n, p is above (below) the value defined in (5), firms in the final sector suffer losses (earn profits), so that sector Y shrinks (expands).

3.2 The labour market and the intermediate sector

Wages are set through decentralized Nash bargaining between firms and workers. Workers receive a fraction β of the total surplus generated from a match $S(\varepsilon)$. Since continuous re-negotiation is assumed, also wages are contingent on the realization of ε.

Unemployed workers receive random job offers, which they accept provided that the asset value of their human capital when employed is higher than that while searching. Because new matches always occur at the lowest realization of costs and the unemployed do not receive unemployment compensations, workers always accept the job offer when unemployed (see Appendix 1).

Firms in the intermediate sector must decide upon entry and exit in the industry. Since firms have always the alternative of being idle – and having zero asset value – entry occurs until the asset value of vacancies V is positive, and exit occurs as soon as the asset value of a filled match $J(\varepsilon)$ becomes negative. The asset value of a generic active firm (a filled job) facing costs $c + \sigma\varepsilon$ is obtained from[9]

$$rJ(\varepsilon) = p - c - \sigma\varepsilon - w(\varepsilon) + \lambda \int [J(z) - J(\varepsilon)]\, dF(z) \tag{6}$$

where the last term on the right hand side represents the expected "capital gain" from changes in future firm's value. Inspection of (6) is sufficient to envisage that sufficiently high realizations of the cost shock ε may cause so big instantaneous losses to generate negative values of $J(\varepsilon)$. The following implicit equation defines the cut-off cost value, ε_d, above which jobs are destroyed (see Appendix 1 for derivation)

$$p - c - \sigma\varepsilon_d = \frac{\beta\gamma\theta}{1-\beta} - \frac{\sigma\lambda}{r+\lambda} \int_{\varepsilon_l}^{\varepsilon_d} F(z)dz. \tag{7}$$

By differentiation it is established that $\frac{\partial\varepsilon_d}{\partial p} = \frac{1}{\sigma\left[1 - \frac{\lambda F(\varepsilon_d)}{r+\lambda}\right]} > 0$ and $\frac{\partial\varepsilon_d}{\partial\theta} = \frac{-\beta\gamma/(1-\beta)}{\sigma\left[1 - \frac{\lambda F(\varepsilon_d)}{r+\lambda}\right]} < 0$. Consequently, the job destruction rate, $\lambda\left[1 - F\left(\varepsilon_d\right)\right]$, decreases with p and increases with θ.

The next step to determine equilibrium in the labour market is the characterisation of the condition giving the supply of vacancies. Recalling that new firms have the lowest level of costs ($c + \sigma\varepsilon_u$), that there is free-entry in vacancies ($V = 0$), and that $S(\varepsilon_d) = 0$ by definition, after manipulations the following relation between ε_d and θ is obtained (see equation (19) in Appendix 1):

$$q(\theta) = \frac{\gamma}{1-\beta} \cdot \frac{r+\lambda}{\sigma\left(\varepsilon_d - \varepsilon_l\right)} \tag{8}$$

Equations (7) and (8) determine simultaneously θ and ε_d. The rate of job creation (as measured by $\theta q(\theta)$) and that of job destruction (namely, $\lambda\left[1 - F(\varepsilon_d)\right]$) emerge from the system of these two equations as equilibrium phenomena. The equilibrium values for θ and ε_d are described graphically in Figure 1.a. Equation (7) describes a negatively sloped curve in the (ε_d, θ) space (the JD curve). The negative slope is due to the fact that a higher θ increases the outside options for workers. Having to pay higher wages, firms (jobs) are destroyed more easily, and the cut-off shock ε_d falls. The JC curve (given by equation (8)) is instead positively sloped. A higher ε_d is associated with a longer expected life time for a filled job, a higher asset value for vacancies, and then a higher θ.

[Figure 1]

[9] All the folllowing expressions for asset values refer to the steady-state, where asset values remain constant over time.

One more condition is necessary to determine equilibrium in the labour market: the equality of inflows and outflows in and out of unemployment

$$\theta q(\theta)u = \lambda \left[1 - F(\varepsilon_d)\right](1-u), \qquad (9)$$

which defines the Beveridge curve in the (v, u) space. The labour market is described by the recursive system formed by (7), (8) and (9): equations (7) and (8) give ε_d and θ; u is derived from (9). Because only one value for θ satisfies the system formed by (7) and (8) for a given p, this relation is represented by a straight line through the origin as described in Figure 1.b. (remember that $\theta \equiv v/u$). The theta-line represents the locus of points consistent with optimal entry and exit in the labour market. Equation (9) is represented by the BC curve. Henceforth we limit the analysis to cases where the BC curve is negatively sloped on the whole domain.[10]

Because total production of X goods equals total steady-state employment, when the labour market is in equilibrium, the intermediate sector is also in equilibrium, conditional on a given value of p.

3.3 General equilibrium

Recalling that $u = 1 - n/L$, the model is described by a system of four equations: (5), (7), (8), and (9) in four unknowns: ε_d, n, v and p. This system is non linear, but its solution can be characterised graphically.

We start by looking at the equilibrium in the final sector. It is fully described by equation (5). Graphically, the relation is represented in the (p, n) space as an upward sloping curve. This curve is depicted in Figure 3. Since along the curve described by (5) we have equilibrium in the final sector Y, this curve is denoted by YY.

As for the intermediate sector X, its equilibrium in the labour market (and in sector X) occurs at the intersection of the theta-line and the BC curve associated with a given value of p, as described in Figure 1.b. Note from (7) that the level of prices enters the expression of the threshold cost value ε_d, but do not affect the condition of free entry in the supply of vacancies, expressed by equation (8). Graphically, when p rises, the JD curve shifts upwards in the (ε_d, θ) space, as illustrated in Figure 2.a., leading to higher ε_d and higher θ in equilibrium. The intuition is as follows. Because job destruction is reduced when p rises, the expected lifetime of a filled job increases. Consequently, the asset value of a newly created firm increases, leading to more vacancies and a higher equilibrium θ.

[Figure 2]

[10] Mortensen and Pissarides (1994)) also limit their analysis to a negatively sloped BC. Conditions can be found concerning the distribution of the shocks under which the BC is monotonically negative.

Thus, as p rises, the value of θ rises as well, and the theta line is moved upwards (Figure 2.b.). Moreover, since the value of the cut-off shock ε_d is unambiguously higher if p is higher, the rate of job destruction goes down when p rises. Graphically, the BC curve is pushed downwards. It follows that when intermediate good prices goes up, unemployment is reduced because of a simultaneous upward move in the theta-line and a downward shift in the Beveridge curve, as depicted in Figure 2.b. Vacancies instead may either go up or down as p rises.

Using the relation $u = 1 - n/L$ one can say that employment, and then the mass of intermediates produced, rises as p rises. We express this positive relation between p and n along a curve denoted by XX and depicted in Figure 3. Along the XX we have equilibrium in the labour market and the intermediate sector for all possible level of prices. The general equilibrium of the economy is represented graphically at the intersection of the YY and the XX curves, as depicted in Figure 3. We focus the analysis on equilibria with unemployment.[11]

[Figure 3]

The emergence of one or more equilibria, and their stability, crucially depends upon the curvature of the YY and XX curves. The curvature of the YY curve depends upon the extent of increasing returns from variety (the parameter ρ). The shape of the XX crucially depends on the form of the matching function and that of the distribution of the shocks, $F(z)$. In the following analysis we assume the YY to be concave and the XX to be monotonically convex. As shown in Appendix 2, this assumption ensures that when (non-trivial) equilibria exist, they are two, and that the only stable equilibrium is the one with higher employment. The concavity of the YY curve is guaranteed by $\frac{1}{2} < \rho < 1$ (the degree of increasing returns should not be too high). The convexity of the XX curve is obtained unde appropriate condition on the distribution of the shocks and the matching function. This is the case, for instance, when $F(z)$ is uniform and $q(\theta)$ has constant elasticity.[12]

4 International trade

4.1 Analysis

[11]Notice indeed that when the YY lies above the XX for $n = L$ equilibrium exhibits full employment, i.e., $n = L$, $p = L^{\frac{1-\rho}{\rho}} = w$.

[12]As an illustration, consider $L = 1$, $q(\theta) = \theta^{-0.5}$, $\beta = 0.5$, $c = 1$ and $\gamma = 1$, and assume that $F(.)$ is uniform on $[-1, 1]$. The XX curve is then described as follows $p = 1 + \frac{2\Theta\lambda+\Theta^2}{4} + \frac{2\sigma+\Theta^2}{2}\varepsilon_d + \frac{\Theta^2-2\Theta\lambda}{4}\varepsilon_d^2$,where $\Theta = \frac{\sigma}{r+\lambda}$ and $\varepsilon_d = \frac{[2\lambda(r+\lambda)+\sigma]n-\sigma}{[2\lambda(r+\lambda)-\sigma]n+\sigma}$. An equilibrium with positive employment requires $2\lambda(r + \lambda) > \sigma$, a condition that also guarantees the convexity of the XX curve.

Recall that Home and Foreign are symmetrical in all respects, except population size, L and L^* (foreign variables are distinguished by an asterisk; without loss of generality, we set $L > L^*$). How the autarchic equilibrium is behaved in the two countries? Symmetry in input prices holds, so that YY is identical for the two countries (YY_A in Figure 4). Since the matching technology is homogenous of degree one, the equilibrium in the labour market is not affected by country size (equations (7), (8) and (9) are independent of L). What is instead affected by country size is the relation between the mass of active firms and the rate of unemployment. At a given rate of unemployment, the mass of employed workers (of produced inputs) in the larger country (Home) is higher than that prevailing in the smaller country (Foreign). Consequently, as depicted in Figure 4, XX lies below XX^*. Under autarchy, the large country experiences higher prices, produces more intermediates and experiences lower unemployment than the small country.[13]

[Figure 4]

Assume now that Home and Foreign are allowed to trade, and that trade may take place both in the final good and in intermediates. How equilibrium would change after trade integration? First, note that XX and XX^* are not affected when the economies move from autarchy to free-trade because firms in the X sector are not directly affected by the opening of trade. Each producer of the final good, instead, will start using all the input varieties available on the international market in order to better exploit the gains from increased input variety. Each intermediate good is still produced by only one firm, that now supplies the entire world demand. Because of the assumed symmetry in production technologies, all inputs produced worldwide have the same price after the opening of trade. Trade is balanced, hence the following relationship between the fraction of each intermediate used in Home and Foreign (respectively, D and D^*, $D + D^* = 1$) and the mass of input varieties produced in each country holds

$$\frac{D}{D^*} = \frac{n^*}{n}. \tag{10}$$

After the opening of trade the YY curve is shifted upward for both countries, equilibrium in the final good market being now described by $p = (n + n^*)^{\frac{1-\rho}{\rho}}$. In figure 2, equilibrium in the final good sector is now described along YY_T in Home and along YY_T^* in Foreign. *At a trade equilibrium, prices for intermediates increase, and unemployment decreases in both*

[13]This result (as others associated with the existence of increasing returns) might seem counterfactual. We do not systematically observe higher unemployment in small countries. However, a correct test should only consider autarchic countries and abstract from differences in technology and labour market institutions.

countries. The intuition underlying this result is simple. As new varieties are made available, productivity in the final sector increases. This leads to an expansion of sector Y, and then to higher demand for each possible variety of intermediates supplied by upward firms, whose price rises. This, in turn, leads to an expansion of sector X, because jobs (firms) are less easily destroyed there. The rate of job destruction falls and the degree of labour market tightness rises (graphically, the theta-line turns upwards and the BC shifts downwards as depicted in Figure 2.b.). A tighter labour market increases the probability for each unemployed to match with a searching firm, and this results into lower unemployment and an expanded X sector. A larger mass of intermediate goods available leads in turn to higher productivity in the final sector. So, there is a *feedback from upward to downward firms through the labour market.* The process goes on until a new steady-state equilibrium is established where input prices are higher and unemployment is lower because both the job destruction rate has falles and the rate of job creation has risen.

4.2 Discussion

A number of remarks are in order. The first concerns the welfare effects of trade integration under imprefect matching in the labour market. The opening of trade leads to higher employment and higher productivity. Gross output in expected terms, pn, unambiguously rises.[14] However, this does not necessarily mean that countries' welfare necessarily increases after trade integration. Countries' welfare is measured by expected output net of non-labour costs and search costs: $(p-c-\sigma E(\varepsilon|\varepsilon \leq \varepsilon_d))n-\gamma v$. There is no reason to expect that equilibrium in the labour market leads to a socially efficient outcome: a "thick-market externality" is at work. When posting a vacancy or shutting down operations, firms do not take into account the effect of their actions on others' probability of matching.[15] Under such a framework, unemployment could be inefficiently low, because obtained in association with too high search costs (high γn) and excessive labour hoarding (high $E(\varepsilon|\varepsilon \leq \varepsilon_d)$). Thus, it might be the case that the inefficiencies associated with the thick market externality are further aggravated by the opening of trade. However, these additional inefficiencies will hardly be strong enough to offset the rise in gross output and decrease welfare.[16]

A second remark concerns a frequently debated side effect of trade in-

[14] Zero profits in the final good sector implies $Y = pn$.

[15] Under an exogenous job destruction framework it has been shown by Hosios (1990)) that the thick market externality is internalised if and only if $\beta = \eta$, namely, when the bargaining power of workers is equal to the elasticity of substitution of $q(\theta)$.

[16] For instance, it is easy to check (see footnote 11) that with a matching function with constant elasticity equal to $\frac{1}{2}$ and a uniform distribution of shocks, vacancies unambiguously fall and firms' earnings $(p - c - \sigma E(\varepsilon|\varepsilon \leq \varepsilon_d)$ rise, so that welfare increases.

tegration. It is often argued that among the structural effects entailed by deeper trade integration between countries there is increased volatility in firms' prices and costs. The possible reasons behind this eventuality are many. In general, the opening of trade exposes firms also to shocks (concerning demand, technology, factor supplies or economic policy) of foreign origin. If domestic shocks and shocks of foreign source are, as we often observe, positively correlated, the result is an increase in the variance of the shocks received by firms. Higher volatility is in turn considered as a possible cause for increased job-turnover, reduced tenure, and higher steady-state unemployment.[17] Though this model does not explain *why* trade may lead to greater volatility, it can show what would happen to unemployment *if* the environment where firms operate becomes more volatile after trade. In our model, a more volatile environment in which firms operate is associated with an increase in the variance of firms' cost shocks, σ. It can be shown that, as in Mortensen and Pissarides (1994), an increase in σ in this model raises the rate of job destruction under reasonable assumptions (see Appendix 3). The value of the shock at which jobs are destroyed ε_d is reduced because shocks of a higher magnitude become more likely. However, the rate of job creation unambiguously rises at the same time. The reason is the following. The distribution of the shocks that filled jobs actually receive is truncated at ε_d. A mean-preserving increase in the variance of the shock has therefore a first order effect only on the left tail of the distribution of shocks received by jobs because the effect on the right tail is only indirect, through a change in ε_d, and of second order. This leads to a higher asset value for filled jobs, and a consequent stimulus for job-creation. The overall impact of a more volatile production environment on unemployment is thus ambiguous. In summary, the widespread presumption that a variable and volatile environment caused by the exposure of firms to international trade is *per-se* responsible for lower job tenure and higher frictional unemployment cannot be supported without further qualifications.

Finally, we want to discuss the robustness of our results. Are the results presented so far likely to hold under more general production structures? May Stolper-Samuelson effects associated with inter-industry trade act in the opposite direction, leading to lower demand for labour, and then higher unemployment? To address these questions we need to introduce modifications in the production set-up of the model and allow countries to differ in their relative factor endowments. Under such a modified framework, we expect that labour demand would fall, and then unemployment worsen in the labour-scarce country only if the extent of increasing returns is not too high and if countries are sufficiently different as far as their endowments are concerned (as shown in Krugman (1981)). However, if countries are not too dissimilar, free-trade will generally spur employment in both.

[17] See, for instance, Bhagwati and Dehejia (1994) and Rodrik (1997).

5 Concluding remarks

In this paper, we have proposed an approach to study of the impact of trade on unemployment, allowing for a separate analysis of job destruction and job creation. Our aim was to provide a model that serves as a flexible tool in analysing the effects of trade among developed economies on equilibrium unemployment. The model tends to give a clear-cut answer to the trade and jobs issue: the more trade is free, the lower will be the unemployment rate in the long run.

Trade integration entails a *direct* effect on job destruction. The increase in productivity due to trade induces an entry process that raises firms' demand and then prices. This, in turn, allows firms to resist to shocks of a greater magnitude, and this leads to a lower rate of job destruction in the steady state. The opening of trade also produces a positive, indirect effect on job creation. In the steady state more vacancies are opened because firms attach a higher value to a filled job due to its longer expected duration. This in turn raises the probability of matching between unemployed workers and searching firms.

Deeper trade integration is often associated with a more uncertain environment for firms, volatile price-cost margins, and then higher job destruction. Our model allows to evaluate the impact on steady-state unemployment of such an eventuality. Long-run unemployment hardly increases after trade even under the hypothesis that the disturbances that affect firms' margins become more volatile. Greater volatility in price-cost margins would be associated with higher job destruction but also with more job-creation, thus having ambiguous effects on unemployment. The reason is that a larger dispersion of cost shocks would have first-order effects only on the left tail of the cost distribution concerning filled jobs, thus increasing their asset value and incouraging entry.

From a positive viewpoint, the model shows how the productivity effects associated with trade may play at odds with a common perception that growing world trade ("globalisation") is responsible for greater labour turnover, job insecurity and then frictional unemployment. The prediction of our analysis is that, in the long run, enlarged trade possibilities are likely to lead to more job openings and also to longer job tenure. As for the implications for empirical analysis, our model, as others (e.g., Matusz (1996)), suggests that important effects played by trade on the employment performance of the economies may not be reflected in *relative* price changes. Rather, the right direction for empirical reasearch should be that of investigating those links that relate international trade to between-firms, within-industries job-relocation, a route that has been only recently explored (e.g. Levinsohn (1996)).

A Appendix 1. Equilibrium in the labour market

A.1 Deriving job destruction

When new jobs are created, fixed costs are at their minimum $(c + \sigma\varepsilon_l)$, so that V is independent of ε. Free-entry in the supply of vacancies implies $V = 0$, and then, since at the steady state $V = -\gamma + q(\theta)(V - J(\varepsilon_l))$,

$$J(\varepsilon_l) = \frac{\gamma}{q(\theta)}. \tag{11}$$

Denote by $S(\varepsilon)$ the asset value of the total surplus generated in an active firm incurring cost $c + \sigma\varepsilon$. Notice that also U is independent of ε, because unemployed are matched with newly created firms. Nash bargaining yields

$$W(\varepsilon) - U = \beta S(\varepsilon), \tag{12}$$

$$J(\varepsilon) = (1 - \beta)S(\varepsilon). \tag{13}$$

Since the outside opportunity for an active firm is to shut-down operations and start searching again in the labour market, the value of an existing firm must be non-negative. Asset values for workers' human capital when active and unemployed are, respectively, defined by

$$rW(\varepsilon) = w(\varepsilon) + \lambda\beta \int [\max(S(z), 0) - S(\varepsilon)]\, dF(z), \tag{14}$$

$$rU = \theta q(\theta) [W(\varepsilon_l) - U]. \tag{15}$$

Using (13), (6) can be rewritten as follows

$$rJ(\varepsilon) = p - c - \sigma\varepsilon - w(\varepsilon) + \lambda(1 - \beta) \int [\max(S(z), 0) - S(\varepsilon)]\, dF(z). \tag{16}$$

Substituting $w(\varepsilon)$ in (16) from (14) and using (13), (12) and (15), the following expression is obtained

$$rS(\varepsilon) = p - c - \sigma\varepsilon - \theta q(\theta)\beta S(\varepsilon_l) + \lambda \int [\max(S(z), 0) - S(\varepsilon)]\, dF(z). \tag{17}$$

ε_d is defined as the cut-off value for ε above which the value of a match is negative, so (17) rewrites

$$(r + \lambda)\, S(\varepsilon) = p - c - \sigma\varepsilon - \theta q(\theta)\beta S(\varepsilon_l) + \lambda \int_{\varepsilon_l}^{\varepsilon_d} S(z) dF(z). \tag{18}$$

Differentiation of (18) yields $\frac{\partial S(\varepsilon)}{\partial \varepsilon} = \frac{-\sigma}{r+\lambda}$. Taking into account that $S(\varepsilon_d) = 0$, using integration by parts it is verified that $\int_{\varepsilon_l}^{\varepsilon_d} S(z)dF(z) = -\int_{\varepsilon_l}^{\varepsilon_d} \frac{\partial S(\varepsilon)}{\partial \varepsilon} F(z)dz$, so that

$$(r + \lambda)\, S(\varepsilon) = p - c - \sigma\varepsilon + \frac{\sigma\lambda}{\lambda + r} \int_{\varepsilon_l}^{\varepsilon_d} F(z)dz - \theta q(\theta)\beta S(\varepsilon_l). \tag{19}$$

Using (11), (13) and the fact that $S(\varepsilon_d) = 0$, the cut-off cost level is the one that solves

$$p - c - \sigma\varepsilon_d = \frac{\beta\gamma\theta}{1-\beta} - \frac{\sigma\lambda}{\lambda + r}\int_{\varepsilon_l}^{\varepsilon_d} F(z)dz \tag{20}$$

A.2 Deriving job creation

New jobs are created at the lowest level of costs ($c+\sigma\varepsilon_u$) and up to the point in which the gain from opening a new vacancy is zero, i.e., when $\varepsilon = \varepsilon_d$. So, the value of a newly created firm (job) is

$$rJ(\varepsilon_l) = p - c - \sigma\varepsilon_l - w(\varepsilon_l) + \lambda\int_{\varepsilon_l}^{\varepsilon_d} \left[J(z) - J(\varepsilon_l)\right] dF(z). \tag{21}$$

Using free-entry in vacancies ($V = 0$), after manipulations (see equation (19), expression (21) can be written as:

$$(r+\lambda)S(\varepsilon_l) = p - c - \sigma\varepsilon_l + \frac{\sigma\lambda}{r+\lambda}\int_{\varepsilon_l}^{\varepsilon_d} F(z)dz - \theta q(\theta)\beta S(\varepsilon_l) \tag{22}$$

Noting from (19) and (22) that $S(\varepsilon_l) - S(\varepsilon_d) = \frac{\sigma(\varepsilon_d - \varepsilon_l)}{r+\lambda}$ and that $S(\varepsilon_d) = 0$ by definition, using result (11) implied by free-entry, we obtain

$$q(\theta) = \frac{\gamma}{1-\beta}.\frac{r+\lambda}{\sigma(\varepsilon_d - \varepsilon_l)}. \tag{23}$$

B Appendix 2. Existence and stability of equilibria.

B.1 Existence

We show that parameter values exist that guarantee a solution for the system formed by (5), (7), (8) and (9) that characterise equilibrium under autarchy. Recall first that the YY curve describes (5) while the XX curve is obtained from the system of (7), (8) and (9). An equilibrium for the system is a point in the (p, n) space where the XX and the YY curve cross. Denote, in the sequel, values for p and n along the YY and the XX curve, respectively, by p_{yy}, n_{yy}, and p_{xx}, n_{xx}.

It is useful to characterize the behaviour of the curves at the limit. As for the YY curve, one easily checks from (5) that $\lim_{n\to L} p_{yy} = L^{\frac{1-\rho}{\rho}}$ and $\lim_{n\to 0} p_{yy} = 0$. Concerning the XX curve, note first that equiliibrium in the labour market implies $\lim_{n\to 0} \theta = 0$ and $\lim_{n\to 0} \varepsilon_d = \varepsilon_l$. By continuity and homogeneity $\theta q(\theta) \equiv g(\theta)$ is continuous and monotonically increasing, and then invertible. Equation (9) can therefore be re-expressed as $\theta = g^{-1}\left[\lambda\left(1 - F(\varepsilon_d)\right)\frac{n}{L-n}\right]$;

the limit behaviour of θ follows from the Inada conditions. Equation (8) and Inada conditions imply that $\lim_{\theta\to 0} \varepsilon_d = \varepsilon_l$, so that, by the previous result, we must have $\lim_{n\to 0} \varepsilon_d = \varepsilon_l$. It follows by (7) that $\lim_{n\to 0} p_{xx} = c + \sigma\varepsilon_l$. Namely, the XX curve has a non-negative constant term on the vertical axis for $n \to 0$. Recall (by the argument in section 3.3.) that the XX curve is monotonically increasing. Thus, denoting by $\overline{p}$ the limit value of XX for $n \to L$, we have $\lim_{n\to 0} p_{xx} = \overline{p} \geq c + \sigma\varepsilon_l$. An equilibrium with unemployment requires $\overline{p} > L^{\frac{1-\rho}{\rho}}$. Hence, there necessarily exists $\widehat{n}$, $n \in [0, L)$, such that $p_{xx} > p_{yy}$ for $n \geq \widehat{n}$. An equilibrium therefore always exists if parameters can be found under which $p_{xx} \leq p_{yy}$ for at least one value of $n \in [0, L)$. For any n small and positive, sufficiently low values for c can be found to satisfy $p_{xx} \leq p_{yy}$.

B.2 Stability

The dynamics outside the XX curve are described by $\dot{u}= \lambda\left[1 - F(\varepsilon_d)\right](1 - u) - u\theta q(\theta)$. From the definition of XX, we have $sign(\dot{n}) = sign(n_{xx} - n)$. As for the dynamics outside the YY we simply assume that above (below) the YY firms in the Y industry suffer losses (earn profits), so that the Y sector contracts (expands), and prices for intermediates decreases (increases). Consequently, $sign(\dot{p}) = sign(p_{yy} - p)$. Concavity of the YY (namely, $\frac{1}{2} < \rho < 1$) ensures that the XX and the YY either cross twice or are tangent. At most three equilibria may be obtained in the (p, n) space, as illustrated in Figure 3. The first is a degenerate zero-employment equilibrium, where the price equals c along the XX. The second is a "low-level" equilibrium with positive employment, the third is a "high-level" equilibrium. Given the adjustment dynamics described above, the "high-level" equilibrium is the only non-degenerate stable equilibrium.

C Appendix 3. The effects of higher volatility

In order to establish the reaction of the equilibrium to a more volatile environment equations (7) and (8) are differentiated with respect to σ. This gives the following expressions:

$$-\sigma\left(\frac{r + \lambda\left[1 - F\left(\varepsilon_d\right)\right]}{r + \lambda}\right)\frac{\partial\varepsilon_d}{\partial\sigma} = \frac{\beta\gamma}{1-\beta}\frac{\partial\theta}{\partial\sigma} + \varepsilon_d - \frac{\lambda}{r+\lambda}\int_{\varepsilon_l}^{\varepsilon_d} F(z)dz \quad (24)$$

$$\sigma\left(\varepsilon_d - \varepsilon_l\right)\frac{\eta}{\theta}\frac{\partial\theta}{\partial\sigma} = -\sigma\frac{\partial\varepsilon_d}{\partial\sigma} - \left(\varepsilon_d - \varepsilon_l\right) \quad (25)$$

Substitution of $\delta\varepsilon_d/\delta\sigma$ from (24) into (25) implies that $\delta\theta/\delta\sigma$ has the opposite sign of

$$\begin{aligned} \varepsilon_l + \left[\varepsilon_d - \frac{\int_{\varepsilon_l}^{\varepsilon_d} F(z)dz}{F(\varepsilon_d)} \right] \frac{\lambda F(\varepsilon_d)}{r + \lambda [1 - F(\varepsilon_d)]} &= \\ \varepsilon_l + \frac{\lambda F(\varepsilon_d)}{r + \lambda [1 - F(\varepsilon_d)]} E(\varepsilon | \varepsilon \leqq \varepsilon_d) &< 0 \end{aligned} \tag{26}$$

The negative sign follows from the fact that $E(\varepsilon) = 0$. It follows that $\delta\theta/\delta\sigma$ is unambiguously positive, which implies that job creation increases with an increase in the variance of firms' cost shocks, σ.

Substitution of $\delta\theta/\delta\sigma$ from (25) into (24) shows that $\delta\varepsilon_d/\delta\sigma$ has the opposite sign of the expression

$$\sigma\varepsilon_d - \frac{\sigma\lambda}{r + \lambda} \int_{\varepsilon_l}^{\varepsilon_d} F(z)dz - \frac{\beta\gamma}{1 - \beta} \frac{\theta}{\eta} = p - c - \frac{\beta\gamma\theta}{1 - \beta} \left(1 + \frac{1}{\eta} \right) \tag{27}$$

As $-1 < \eta < 0$, it follows that $p \geqq c$ is sufficient to ensure that ε_d is smaller when σ is higher, which implies that job destruction increases.

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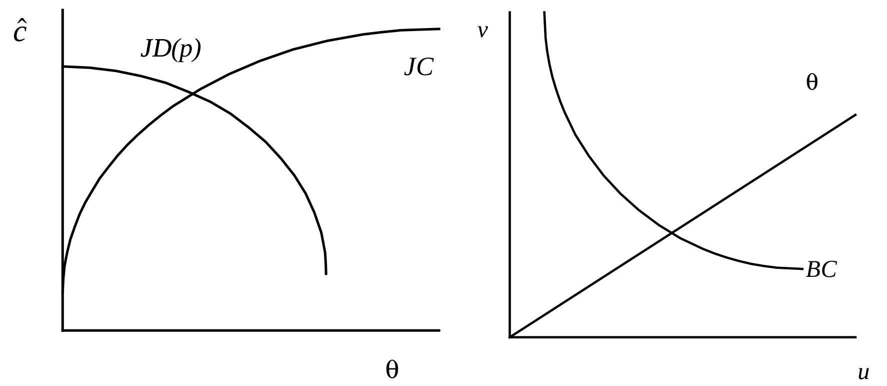

Figure 1.a. Job destruction and job creation Figure 1.b. Unemployment and vacancies

Figure 1
Equilibrium in the labour market

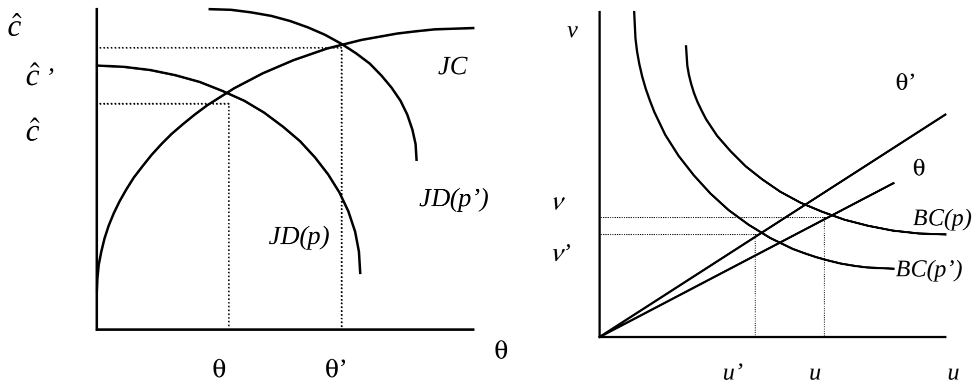

Figure 1.a. Job destruction and job creation Figure 1.b. Unemployment and vacancies

Figure 2
The labour market when prices are p and p', p'>p

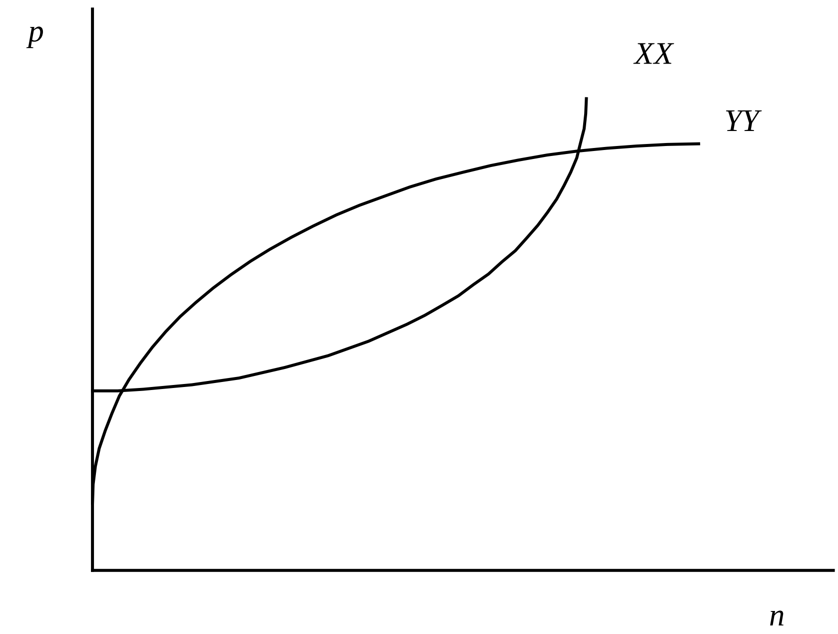

Figure 3
General equilibrium

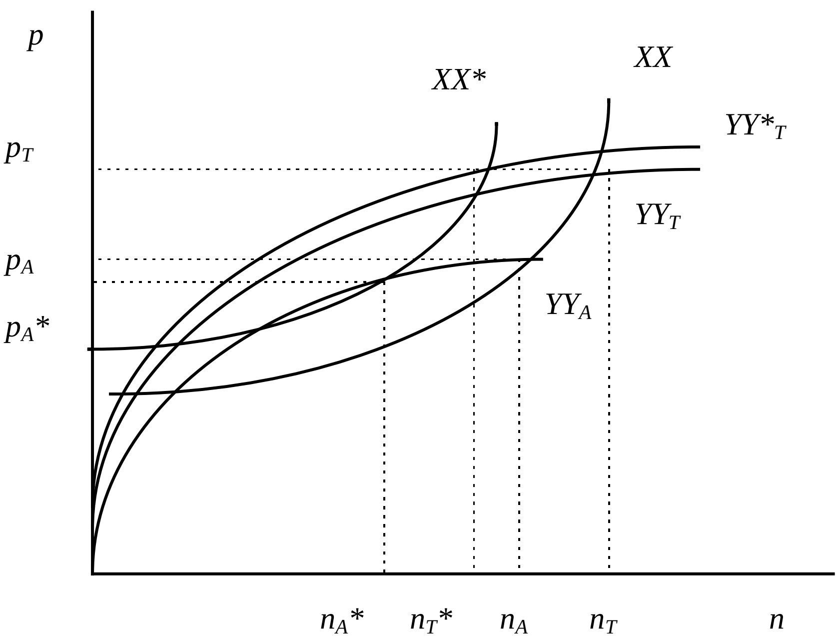

Figure 4
The opening of trade