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Exchange rates do matter: French job reallocation and exchange rate turbulence, 1984–1992

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Abstract

This paper evaluates the impact of exchange rate fluctuations on inter- and intra-sectoral job reallocation. First, a vintage model of factor reallocation in a small open economy facing real exchange rate fluctuations is developed. Movements in the real exchange rates affect the profitability of production units, and the pattern of entry and exit. The model predicts a 'bunching' of entry and exit around the peak of predictable appreciation episodes, as less productive firms are cleansed and newcomers adopt more efficient technologies. The paper then investigates empirically the pattern of job creation and destruction in response to real exchange rate movements in France between 1984 and 1992, using disaggregated firm level data. Traded-sector industries are very responsive to real exchange rate movements. In the benchmark estimation, a 1% appreciation of the real exchange rate destroys 0.95% of tradable jobs over the next two years. Further, job creation is more volatile than job destruction. The results indicate the importance of large unanticipated changes in the real exchange rate.

JEL classification: F16; F31; F4; J4; E24

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1. Introduction

In the early 1980s, the strength of the dollar was often designated as the villain behind the loss of competitiveness of US auto makers and steel producers. Since 1992, Italy and the UK have enjoyed a bout of growth, after leaving the European Exchange Rate Mechanism with a much depreciated currency. More recently, the Asian crisis, and its train of currency devaluations, re-ignited old fears that European or American jobs might soon be lost to competitive Asian economies. These episodes share a common ingredient: large swings in the nominal exchange rate that potentially affect the profitability of industries exposed to international competition.

The logic underlying the argument is quite straightforward. Nominal exchange rates fluctuations are pronounced and very persistent. By contrast, prices do not exhibit nearly as much volatility.[1] Consequently, movements in the nominal exchange rate dominate fluctuations in the real rate. Real exchange rates, in turn, measure the relative price of domestic and foreign goods. Like any relative price, movements in the real exchange rate direct resources to and from specific sectors of the economy. Pronounced and long-lasting deviations in real exchange rates should have a profound effect on exporting or import-competing firms as well as non-traded goods producers. They may affect production decisions, prices and profit margins, factor demands as well as – for exporters – the decision to enter or exit foreign markets.

The traditional two-sector neo-classical model emphasizes inter-sectoral factor reallocation in response to exchange rate movements. An appreciation lowers factor demand in the traded sector and increases it in the nontraded sector. Inputs are continuously reallocated as the economy moves along its production possibility frontier.

Yet such a simple model has nothing relevant to say about the gross margins that bring about a given change in sectoral employment. For instance, a given *net* sectoral employment decline can be brought about through a simultaneous decline in job creation and destruction – i.e. a ‘chill’ – a simultaneous increase – i.e. a ‘shake-out’ – or opposite changes in gross flows. The welfare implications can be quite different. A ‘shake-out’ might rejuvenate an aging industry as capital is upgraded, technological improvements are implemented and qualified workers hired. This can be beneficial if the economy exhibits too much sclerosis, or harmful if it leads to early termination of production relationships otherwise valuable.[2] On the other hand, a ‘chill’ delays entry and exit and increases the average age of plants and physical capital. This increased sclerosis can be

[1] This point was forcefully demonstrated by Mussa (1986).

[2] See Caballero and Hammour (1996) for an application of these ideas to business cycles and Caballero and Hammour (1997) for an application to developing economies.

harmful if it prevents the scrapping of obsolete and otherwise inefficient production units.

This paper provides a theoretical framework to address some of these issues. It focuses on job reallocation and builds upon the recent one-sector non-representative agent models of reallocation that have recently been developed in the macro literature. It extends this literature by considering explicitly real exchange rate fluctuations. Two key ingredients are incorporated in an otherwise standard small open economy model: heterogeneity and non-convex adjustment costs. Heterogeneity and non-convex frictions are amply documented in plant or firm level studies and are a necessary starting point for any meaningful distinction between net and gross flows.[3] Heterogeneity can take various forms: firms or plants within a narrowly defined industry differ in their technology, management and workers skills, access to credit and financial markets, geographical location, sheer luck... In this paper, I concentrate on differences in technology as a primary source of heterogeneity across production units. The combination of frictions and heterogeneity leads to non-trivial aggregate dynamics as each individual production unit times its entry/exit decision and/or technological upgrading optimally.

In the resulting dynamic equilibrium, both margins are simultaneously active and intimately connected through movements in the shadow cost of factor inputs. Consequently, movements in the exchange rate trigger *within* sector reallocation. For instance, increased profitability of new production units – following a depreciation – translate into more entry that may drive up the shadow cost of labor sufficiently to force older units out of the market. As the model will make clear, whether this is the case depends on the extent to which firms can time optimally their entry/exit decisions, which in turn depends on the forecastability of exchange rate changes. More predictable currency movements will lead to optimal 'bunching' and a strong positive synchronization of job creation and destruction. Such an economy would alternate episodes of 'turbulence', with higher creation and destruction, and episodes of 'chill' where gross flows are depressed. On the other hand, unanticipated persistent changes, that do not permit as much intertemporal substitution, lead to a negative synchronization of gross flows.

The paper then proceeds to investigate empirically the dynamic adjustment pattern of net and gross job flows in France, from 1984 to 1992. A direct investigation of the reallocation effect of exchange rate movements runs into a number of difficulties. First and foremost, the nominal and real exchange rates are not exogenous. In the long run, the current account has to be stabilized. At shorter horizons, the nominal exchange rate may respond to domestic and

[3] See Davis and Haltiwanger (1990) as well as Caballero et al. (1995, 1997) for empirical evidence on US plants.

foreign monetary conditions as well any other primitive disturbance. There is ample evidence, however, that nominal exchange rate movements are largely orthogonal to innovations in the usual suspects (money, productivity shocks, fiscal and aggregate demand), at least at short to medium horizons.[4] The tricky task consists in extracting that particular element as a source of autonomous fluctuations. Second, domestic monetary policy may itself react to movements in the exchange rate when the central bank follows an exchange rate rule. The response to an unexpected exchange rate depreciation includes, 'à la Lucas', the response to the expected monetary tightening following a depreciation of the currency. Except under special circumstances, it will not be possible to shunt the monetary policy channel.[5] In the limit case where the exchange rate is fixed, exchange rate movements are not properly defined. Shifts in the supply and demand for the domestic currency immediately translate into monetary policy shocks. This problem is particularly acute in the case of France, where the rules of the European Exchange Rate Mechanism imply that the Banque de France *must* follow de facto an 'exchange rate rule'.

To address the first problem, the paper directly controls for aggregate and monetary shocks and attempts to identify exchange rate effects from the cross-section of industries, as in Gourinchas (1998). As for the second problem, the paper proposes to compare the exchange rate sensitivity of industries trading mostly with countries whose currency is not pegged to the French Franc. The endogenous response of expected monetary policy is likely to be a less severe problem in the latter case since the Banque de France is not compelled to adjust.

The empirical results indicate the following:

- Exchange rate fluctuations have a substantial impact on net and gross factor reallocation. In the benchmark regressions, a modest 1% appreciation increases tradable employment growth by 0.9% over the following two years. This represents up to 35,000 additional jobs in the tradable sector over the following two years.
- This variation in net employment is brought about through opposite movements in job creation and destruction of roughly equal magnitude. This indicates relatively little additional 'turbulence' associated with exchange rate fluctuations.
- Lastly, import-competing industries appear more responsive, both in magnitude and timing, than exporters.

Section 2 discusses briefly the existing literature. Section 3 presents a vintage-based model of reallocation similar to Caballero and Hammour (1996a).

[4] See Meese and Rogoff (1983), and Mark and Choi (1997) for longer horizons.

[5] See Bernanke et al. (1997) for an analysis of this problem in the case of oil shocks.

Section 4 discusses the empirical results for the French manufacturing sector. Section 5 concludes.

2. Brief discussion of the literature

As is clear from the preceding discussion, this paper does *not* address the much discussed issue of trade, jobs and wages. Instead the focus of this paper lies squarely on the effect of large, persistent and ultimately mean-reverting changes in real exchange rates on gross job flows.[6]

The empirical literature on the employment effect of real exchange rate movements is scarcer. Branson and Love (1988), in an early paper, studied the response of US manufacturing employment and output to exchange rate movements. They concluded that exchange rate movements were associated with significant output and employment changes. Campa and Goldberg (1998), using two-digit data over a 25 years period, found small employment elasticities and relatively larger wage elasticities to permanent exchange rate changes. Their approach accounts for various channels of international exposure. However, they find only weak correlations between their measure of exposure and the pattern of industry wage-responsiveness. The relative unresponsiveness of employment in their estimates may result from the use of data aggregated at the two-digit level. Reallocation can occur between four-digit sectors, or, as stressed in this paper, *within* four-digit industries. Revenga (1992) uses import prices on selected three- and four-digit US manufacturing industries. Concentrating on import-competing industries, she finds larger employment effects. According to her estimates, the 40%-so real appreciation of the dollar between 1980 and 1985 lowered employment in import-competing industries by 4.5–7.5%.

These papers focus on the *net* job reallocation following real exchange rate changes. By contrast, Gourinchas (1998) studies the exchange rate response of US manufacturing *gross* job flows at the four-digit level, with data from the Longitudinal Research Database. That paper uses industry-specific real exchange rates to identify employment semi-elasticities from the cross-section of industries. Using disaggregated trade data by country of origin and destination, it compared the results for export, import-competing and non-traded manufacturing industries. The results indicate a 0.3% increase in tradable employment growth in the two quarters following a 10% real depreciation, arising mostly from import-competing industries. Further, the paper finds that depreciations are times of 'chill' with a decline in both job creation and

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[6] See Kletzer (1998), Sachs and Shatz (1994), Lawrence and Slaughter (1994), and Borjas et al. (1997) for recent contributions to this literature.

destruction, while appreciation episodes are characterized by an increase in 'churn'.

The present paper addresses a similar set of issues in the case of France, for the period 1984–1992. There are a number of important differences between the two papers. First, France is substantially more open than the US. The ratio of imports to GDP hovers in the vicinity of 20%. By contrast, the openness ratio is only 11.6% in the US.[7] The implication is clear: most French manufacturing industries face significant international exposure. Second, the sources of unemployment differ drastically in the US and Europe. In particular, there is mounting evidence that European unemployment reflects partly the excessive cost of domestic labor as well as institutional rigidities.[8] To capture these features, the model presented in the next section assumes that only traded goods are produced while unemployed workers receive fixed unemployment benefits. Fluctuations in the price of traded goods – the real exchange rate here – imply changes in the shadow cost of labor for tradable producers. The model thus generates naturally flows in and out of employment in response to exchange rate fluctuations.

3. Theoretical considerations

This section presents a model of frictional reallocation with heterogeneity in the form of vintage capital. After presenting the model, I characterize the dynamic adjustment to (a) cyclical fluctuations under perfect foresight and (b) unanticipated persistent shocks to the exchange rate.

3.1. The model

The economy is a small open economy that produces only tradable goods similar to Caballero and Hammour (1996). Labor is the only factor of production. A production unit consists of one worker and one job. Technology is Leontieff and embodied into the production unit at the time the match is created: one unit of labor in a match created at time s produces A_s units of the traded good. A_s represents the technology frontier and increases at the exogenous rate γ. As a result, firms become more and more obsolete as time goes on.

A prospective producer can post a vacancy at a cost of vA_sp_s per unit of time where v is a constant and p_s is the – internationally set – price of the traded good.

[7] From the OECD Economic Outlook, June 1998.

[8] See Cohen et al. (1997), OECD (1995) and Blanchard (1997).

The hiring cost can be thought of in terms of foregone output. Together with embodied capital, this assumption implies that firms are heterogenous.

Workers are either unemployed or employed.[9] Unemployed workers receive unemployment benefits equal to zA_s.[10] The labor force is constant and equal to L. e_s and u_s denote employment in the traded sector and unemployment respectively, with $u_s + e_s = L$. At each instant, a fraction δ of production units are exogenously terminated and the workers return to unemployment.

Workers and jobs are paired with a matching technology similar to that of search-theoretic labor models. I assume a random matching technology with constant returns to scale: the number of jobs created at time s is $h_s = m(u_s, v_s)$ where the number of posted vacancies is v_s. The tightness ratio is defined as usual as $\theta_s = v_s/u_s$, i.e. the ratio of posted vacancies to unemployed workers. With random matching, the instant probability that an employer posting a vacancy fills the position is $h_s/v_s = m(u_s, v_s)/v_s = m(u_s/v_s, 1) = q(\theta_s)$. Similarly, the job arrival rate is $h_s/u_s = \theta_s q(\theta_s)$. I assume the following obvious properties: $\lim_{\theta\to 0} q(\theta) = \infty$, $\lim_{\theta\to 0} \theta q(\theta) = 0$, and $0 \le \eta(\theta) = \theta q'(\theta)/q(\theta) \le 1$. The last property ensures that $q'(\theta) \le 0$ and $(\theta q(\theta))' \ge 0$, i.e. a tighter market decreases the worker arrival rate and increases the job arrival rate.

Search and hiring costs generate quasi rents. Those quasi rents can be partly appropriated by workers in the employment relationship. Once a match is formed, the surplus is shared according to the Nash bargaining rule, with a share β going to the worker and $1-\beta$ to the firm. Unemployment will play the role of an equilibrium device that regulates the incentives of workers and firms to extract the quasi rents.

Firms enter the traded sector as long as profits are positive. There is no aggregate uncertainty and the only source of aggregate fluctuation is the price of traded goods, p_s, determined exogenously. This assumption captures the fact that firms cannot control fluctuations in the nominal exchange rate. This implicitly rules out any pricing to market strategy that would allow firms to offset fluctuations in nominal exchange rates by varying their product prices.[11]

[9] An equivalent formulation of the model assumes that there are two sectors, traded and non-traded and that workers can always get a job in the non-traded sector. In this rendition, jobs in the traded sector carry a premium generated by the quasi-rents associated with search costs. While the two formulations are equivalent, the latter implies that there is no unemployment, a somewhat undesirable feature if literally applied to the European labor market. A more plausible interpretation is that unemployed workers engage into home or non-measured production, the output of which is typically nontraded.

[10] The scaling of entry costs and unemployment benefits is necessary to obtain a balanced growth path long which real exchange rate fluctuations affect gross and net flows. This is formally equivalent to assuming a negative trend in the price of traded goods that reflects productivity gains.

[11] The evidence on pricing to market is somewhat limited and ambiguous. US firms seem not to adjust their export prices in response to fluctuations in the dollar, while Japanese and German firms seem more responsive. See Knetter (1993).

p_s/z represents the relative price of traded goods to the unemployment benefit. Since z is assumed constant, and with a slight abuse of notation, I refer to p_s as the exchange rate. A higher value of p_s indicates that domestic labor becomes relatively less expensive. This is a depreciation.[12]

Workers are risk neutral, infinitely lived, and supply inelastically one unit of labor in every period. The interest rate in terms of traded goods is constant and equal to the rate of time preference.

Under the assumption of perfect foresight, producers and workers can anticipate exactly the duration of the match. Denote T_t the life expectancy of a production unit created at time t. Define $W_s(t)$ the value of holding a job created at time t, as of time s, $t \leq s \leq t + T_t$. $W_s(t)$ must satisfy the following arbitrage equation:

$$rW_s(t) = w_s(t)A_s + \delta(U_s - W_s(t)) + \dot{W}_s(t), \tag{1a}$$

with

$$W_{t+T_t}(t) = U_{t+T_t}, \tag{1b}$$

where $w_s(t)$ denotes the wage in terms of traded goods of a traded sector job created at time t, as of time $s > t$, normalized by productivity A_s. With risk neutral workers, the rate of return on any asset – expressed in tradable – must equate the real interest rate r. The rate of return for a worker in the traded sector is composed of two terms: a dividend yield $w_s(t)A_s/W_s(t)$ and an expected capital gain $(\delta(U_s - W_s(t)) + \dot{W}_s(t))/W_s(t)$. The capital gain itself consists of two terms: the capital loss associated with an early termination of the employment relationship and the change in $W_s(t)$ if employment is maintained. Eq. (1b) says that there is no jump in human wealth when the match is dissolved and the worker becomes unemployed. The human wealth of an unemployed worker looking for a job, U_s, follows:

$$rU_s = \frac{zA_s}{p_s} + \theta_s q(\theta_s)(W_s(s) - U_s) + \dot{U}_s \tag{2a}$$

$$\equiv \tilde{w}_s A_s + \frac{\mathrm{d}}{\mathrm{d}s} U_s. \tag{2b}$$

This equation has a similar interpretation, where the capital gain reflects the probability of finding employment in the traded sector, at rate $\theta_s q(\theta_s)$ and zA_s/p_s is the unemployment benefit, in terms of traded goods.

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[12] This interpretation is also correct if unemployed workers produce non-traded home goods. One can then interpret z as the price of non-traded goods and p_s/z as the relative price of traded and non-traded goods.

$\tilde{w}_s A_s$ is the shadow wage. It is equal to the unemployment benefit zA_s/p_s plus the expected gain from finding a job: $\theta_s q(\theta_s)(W_s(s) - U_s)$.

Denoting V_s and $F_s(t)$ the values of a vacancy posted at time s and a job filled in the traded sector, respectively, created at time t, as of time s, the following asset equations are obtained:

$$rV_s = -vA_s + q(\theta_s)(F_s(s) - V_s) + \dot{V}_s, \tag{3a}$$

$$rF_s(t) = A_t - w_s(t)A_s + \delta(V_s - F_s(t)) + \dot{F}_s, \tag{3b}$$

$$F_{t+T_t} = V_{t+T_t}. \tag{3c}$$

Posting a vacancy costs vA_s per unit of time. With probability $q(\theta_s)$, the vacancy is filled and the asset value jumps to $F_s(s)$. Similarly, a filled position created at time t generates $A_t - w_s(t)A_s$ flow profits and is terminated with probability δ.

Under free entry, $V_s \leq 0$, with equality when entry occurs. In the remainder of the paper, I will assume that the entry margin is always active so that $V_s = 0$. Substituting into Eq. (3a), I obtain the value of a filled position at the time of its creation:

$$F_s(s) = \frac{vA_s}{q(\theta_s)}. \tag{4}$$

The profits generated by the match just cover the expected costs of posting the vacancy, where $1/q(\theta_s)$ is the expected duration of a vacancy.

To derive the entry and exit conditions, define $S_s(t)$ the surplus generated by a match created at time t, as of time $s > t$:

$$S_s(t) = F_s(t) + W_s(t) - U_s.$$

Using the asset equations and the terminal condition that the match must be worthless at the time of exit, or $S_{t+T_t}(t) = 0$, one obtains

$$S_s(t) = \int_s^{t+T_t} (A_t - \tilde{w}_u A_u)\, \mathrm{e}^{-(r+\delta)(u-s)}\, \mathrm{d}u. \tag{5}$$

Since the worker and the firm share the surplus, the exit time T_t is determined so as to maximize Eq. (5):

$$A_t = \tilde{w}_{t+T_t} A_{t+T_t}. \tag{6}$$

This is the *exit condition*. A few points are worth noting here. First, the firm will exit when the flow surplus $(A_t - \tilde{w}_s A_s)$ equals 0. This local optimum is *globally* optimal as long as the underlying technological trend is large enough so that the firm cannot become profitable again in the future.[13] Second, only the shadow

[13] We assume that this condition is satisfied in the remainder of the paper.

cost of labor matters for the exit condition, not the actual wage paid by the firm. This is the case since separations are ex-post efficient.

To derive the *entry condition*, note that (1) under the continuous Nash bargaining the firm will get a share $(1-\beta)$ of the surplus and (2) with free entry, this must just cover the expected search costs:

$$(1-\beta)S_t(t) = (1-\beta)\int_t^{t+T_t} (A_t - \tilde{w}_{sA_s})e^{-(r+\delta)(s-t)}\,ds \le \frac{vA_t}{q(\theta_t)} \tag{7}$$

with equality when entry occurs. Unlike the exit condition (6), the entry condition is forward looking: vacancies will be posted and jobs offered when the share of present discounted value of future quasi-rents going to the firm covers the expected search cost. Search costs depend on the workers arrival rate: when firms are posting a large number of vacancies, the arrival rate drops. This congestion effect increases search costs and helps smooth creation. Conversely, when few firms post-vacancies, it is relatively easy to attract workers and creation cost fall. In this model unemployment facilitates job creation. As a result, the efficient economy will synchronize tightly job destruction and job creation, as previously noted by Caballero and Hammour (1996).

To characterize the shadow wage, use the Nash bargaining formula and substitute (4) into the definition of $\tilde{w}_s$ to obtain

$$\tilde{w}_s = \frac{z}{p_s} + \theta_s \frac{\beta}{1-\beta} v. \tag{8}$$

The shadow wage exceeds unemployment benefits z/p_s as unemployed workers also expect to find a job. $\tilde{w}_s$ increases with θ_s, the share of the surplus going to the workers β and the unit vacancy cost v. Looking at the entry and exit conditions, one sees immediately that exchange rate fluctuations only matter through the shadow cost of labor $\tilde{w}_s$. In particular, exchange rates fluctuations have no effect if unemployment benefits are fully indexed: with $z = \tilde{z}p_s$, the relative labor cost remains unchanged.

To derive the dynamic path for actual wages, $w_s(t)$, first subtract Eq. (1a) from Eq. (2a) and integrate using the boundary condition to obtain

$$W_s(t) - U_s = \int_s^{t+T_t} (w_u(t) - \tilde{w}_u)A_u e^{-(r+\delta)(u-s)}\,du.$$

Using the Nash bargaining assumption, this can be rewritten as

$$\int_s^{t+T_t} w_u(t)A_u e^{-(r+\delta)(u-s)}\,du = \int_s^{t+T_t} \tilde{w}_u A_u e^{-(r+\delta)(u-s)}\,du + \beta S_s(t).$$

Differentiating with respect to time s, one obtains

$$w_s(t)A_s = \tilde{w}_s A_s + \beta(A_t - \tilde{w}_s A_s).$$

The wage at time s, for a match created at time t consists of the shadow wage $\tilde{w}_s$ and a premium that reflects the fraction β of the flow profits appropriated by the worker.

In this economy, employment reflects past hiring decisions:

$$e_s = \int_0^{a_s} h_{t-u} \mathrm{e}^{-\delta u}\, \mathrm{d}u, \tag{9}$$

where a_s is the scrapping age, i.e., the age of the oldest production unit in operation at time s. Under perfect foresight, a_s and T_s are related by the following condition:

$$T_s = a_{s+T_s}.$$

Differentiating Eq. (9) with respect to time and using $e_s + u_s = L$, I obtain an expression for the changes in unemployment:

$$\dot{u}_s = \delta(L - u_s) + (1 - \dot{a}_s)h_{s-a_s}\mathrm{e}^{-\delta a_s} - h_s\,. \tag{10}$$

The first two terms determine job destruction in the traded sector, while the last term reflects job creation. The term $(1 - \dot{a}_s)h_{s-a_s}\mathrm{e}^{-\delta a_s}$ characterizes *endogenous* job destruction. Since $\dot{a}_s \leq 1$ by construction, this term is always positive.[14] Job creation and destruction rates are defined as

$$c_s = \frac{h_s}{L - u_s}, \qquad d_s = \delta + \frac{(1 - \dot{a}_s)h_{s-a_s}\mathrm{e}^{-\delta a_s}}{L - u_s}\,.$$

Together, Eqs. (6), (7) and (10) define a dynamic system that completely characterizes the economy.

3.2. Steady state

In steady state, the real exchange rate $\bar{p}/z$, the lifetime expectancy $\bar{T}$ and unemployment u are constant. The economy satisfies the following equations:

$$\bar{u} = \frac{\delta L}{\delta + \bar{\theta}q(\bar{\theta})(1 - \mathrm{e}^{-\delta\bar{T}})}. \tag{11}$$

The exit condition becomes

$$\bar{\tilde{w}} = \frac{z}{\bar{p}} + \frac{\beta}{1-\beta}\,\bar{\theta}v = \mathrm{e}^{-\gamma\bar{T}}. \tag{12}$$

[14] The age of the oldest unit at time $t + \mathrm{d}t$, $a_{t+\mathrm{d}t}$ must be smaller than the age of the oldest unit at time t, a_t, plus dt. From this, $\dot{a}_t \leq 1$.

while the entry condition is

$$\frac{1}{r+\delta}(1-\mathrm{e}^{-(r+\delta)\bar{T}})-\mathrm{e}^{-\gamma\bar{T}}\left(\frac{1-\mathrm{e}^{(r+\delta-\gamma)\bar{T}}}{r+\delta-\gamma}\right)=\frac{1}{1-\beta}\frac{v}{q(\bar{\theta})}. \tag{13}$$

The comparative statics are tedious but straightforward. As the exchange rate depreciates ($\bar{p}$ increases), both the labor market tightness θ and the life expectancy T increase: since the shadow cost of labor decreases, firms remain profitable longer and want to hire more workers.[15]

In steady state, job creation and destruction rates are given by

$$\bar{c}=\bar{d}=\frac{\delta}{1-\mathrm{e}^{-\delta\bar{T}}}.$$

Average labor productivity is measured by

$$\frac{y_s}{e_s}=\frac{\int_0^{\bar{T}}A_{s-a}h_s\mathrm{e}^{-\delta a}\,\mathrm{d}a}{e_s}=A_s\frac{\delta}{\delta+\gamma}\frac{1-\mathrm{e}^{(\delta+\gamma)\bar{T}}}{1-\mathrm{e}^{-\delta\bar{T}}}.$$

As $\bar{T}$ increases, average labor productivity decreases, units are not replaced as frequently and the economy exhibits more sclerosis. The increased sclerosis lowers both creation and destruction flows. The steady-state unemployment rate unambiguously decreases.[16]

3.3. Dynamics and simulations

Differentiating Eq. (7) with respect to time, I obtain the following equilibrium characterization.

Given an initial employment history $\{u_{-t}\}_{t=0}^{\infty}$, an equilibrium for this economy is a path $\{\tilde{w}_s, w_s(s'), u_s, \mathrm{e}_s, \theta_s, h_s, y_s, a_s, T_s\}_{s'\geq 0, s\geq s'}$ that satisfies

$$v\eta(\theta_s)\frac{\dot{\theta}_s}{\theta_s q(\theta_s)}=\beta\theta_s v+(1-\beta)\left(\frac{z}{p_s}-1+\frac{\gamma}{r+\delta}(1-\mathrm{e}^{-(r+\delta)T_s})\right)$$
$$+(r+\delta-\gamma)\frac{v}{q(\theta_s)}, \tag{14a}$$

$$\dot{u}_s=\delta(L-u_s)-u_s\theta_s q(\theta_s)+(1-\dot{a}_s)h_{s-a_s}\mathrm{e}^{-\delta a_s}, \tag{14b}$$

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[15] Note that if $\bar{p}<z$, the only solution is $\bar{\theta}=0$ and no vacancies are offered in the traded goods sector. To see this note from Eq. (12) that when $\bar{p}<z$, $\bar{\tilde{w}}$ must be bigger than 1. However this is impossible with $\bar{T}\geq 0$. In that case, no vacancies are posted and the entry condition becomes a strict inequality. This cannot be an equilibrium since then the economy does not produce anything. In the remainder of the paper, I assume that $p_s>z$ at all times.

[16] Sclerosis is not synonymous with higher unemployment in this model.

$$A_s = \tilde{w}_{s+T_s} A_{s+T_s}, \quad (14c)$$

$$\tilde{w}_s = \frac{z}{p_s} + \theta_s \frac{\beta}{1-\beta} v, \quad (14d)$$

$$w_s(s') = \tilde{w}_s + \beta(e^{-\gamma(s-s')} - \tilde{w}_s), \quad s \geq s', \quad (14e)$$

$$h_s = u_s \theta_s q(\theta_s), \quad (14f)$$

$$e_s + u_s = L, \quad (14g)$$

$$y_s = \int_0^{a_s} A_{t-u} h_{t-u} e^{-\delta u} \, du. \quad (14h)$$

It is easy to check that the competitive equilibrium is constrained Pareto-optimum if $\beta = \eta$.[17] When this condition is satisfied, the thick market and search externalities offset each other exactly.

This is an endogenous delay-differential system. Given the complexity of such dynamical systems, it is in general not possible to directly analyze the response to any driving process for the exchange rate. In the following subsections, I will split the problem in two. First, I will investigate the response to perfectly foreseeable and long lasting deviations in the real exchange rate. Then, I will look directly at the response to unanticipated changes in deviation to the steady state.

3.3.1. Cyclical perturbations

I focus first on long-lasting and fully predictable deviations of the exchange rate from equilibrium. To capture this idea, I model p_s as a sine wave: $p_s = p_0 + \alpha \cos(\omega s)$. The period $T_\omega = \omega/2\pi$ characterizes the duration of deviations from equilibrium, while the parameter α controls their amplitude. In practice, numerous studies have found a half-life of real exchange rate deviations between 2.5 and 5 years. As an approximation, I will assume that T_ω is equal to 4 years.[18]

Obviously, this driving process imposes a lot of structure on the solution. Given the large volatility in real and nominal exchange rates, this is an extreme assumption. There is however, some benefit to the current solution method: to the extent that real exchange rate do exhibit some predictable and long lasting deviations, agents should build this element into their entry and exit decisions. Furthermore, this will also allow to contrast the results with the next subsection that looks at fully unanticipated changes in the exchange rate.

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[17] See Hosios (1990) and Pissarides (1990).

[18] See Froot and Rogoff (1995) and Rogoff (1996) for a survey.

I solve the system by using an iterative procedure that identifies the periodic solution with the same periodicity as the price function.[19] Fig. 1 reports the results from the simulation of the efficient economy, where $\beta = \eta$.[20]

Panel A reports the real exchange rate p_t. The real exchange rate appreciates 4% between time 0 and 2 and depreciates by the same amount between time 2 and 4. This represents a mild fluctuation in the real exchange rate.

Panel B reports the tightness coefficient for the traded sector. θ presents characteristics substantially similar to the real exchange rate: roughly, it falls initially as the currency appreciates and it becomes less and less profitable to hire new workers. To see why this is the case, remember that the shadow wage $\tilde{w}$ increases as the exchange rate appreciates. With a constant θ, this would lead to an increase in the wage and the firm's share of profits would not cover search costs anymore. As a result, firms post initially less vacancies, reducing θ. This exerts a dampening effect on the shadow wage (panel F). In addition, it directly reduces the hiring cost by increasing the pool of unemployed. θ starts increasing again before the real exchange rate reaches its maximum appreciation: as firms foresee perfectly the upcoming depreciation, they are willing to hire workers early. Under the assumption of perfect foresight, there is no option value associated with movements of the real exchange rate. This departs substantially from the literature on irreversible investment and beach-head effects.[21] In these models, uncertain future values of the exchange rate, together with irreversible entry decisions lead to optimal inaction regions. By contrast, here, firms can anticipate trend reversals. The two views of the world are not incompatible: this paper argues that the medium term fluctuations in the real exchange rate, that are relevant for investment decisions, exhibit reversal patterns. At shorter horizons, the uncertainties associated with fluctuations in the nominal exchange rate do play an important role in explaining entry and exit.

Panel C presents the unemployment rate. As expected, currency fluctuations leads to a *net reallocation* of workers away from the traded sector. Interestingly, we see already here the 'bunching' of reallocation over the cycle. Most of the increase in unemployment comes between $t = 0.5$ and $t = 1.5$, shortly before the appreciation's peak.

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[19] Note that in delay-differential systems, one needs to specify initial conditions for the state variables over some interval. The details of the procedure are as follows. First, I rewrite the system (14a), (14b) in terms of the two variables $x = h/u$ and u, eliminating a and $\dot{a}$ using the exit condition. Second, I solve for the steady state and set the history of hires $\{h_t^0\}_{t \leq 0}$ and lifetime expectancy $\{T_t^0\}_{t \leq 0}$ to their steady-state values. I then find the periodic solution to system (14a),(14b) given $\{h_t^0\}_{t \leq 0}$ and $\{T_t^0\}_{t \leq 0}$. This is implemented with a simple shooting strategy. From this I derive a new set of 'initial conditions' $\{h_t^1\}_{t \leq 0}$ and $\{T_t^1\}_{t \leq 0}$ and iterate until convergence.

[20] The model's parameters are as follows: $z = 1$, $p_0 = 2$, $L = 1$, $r = 0.065$, $\gamma = 0.028$, $\delta = 0.05$, $\beta = \eta = 0.5$, $v = 0.2$ and $\alpha = 0.04$. These parameters are identical to Caballero and Hammour (1996).

[21] See Dixit (1989).

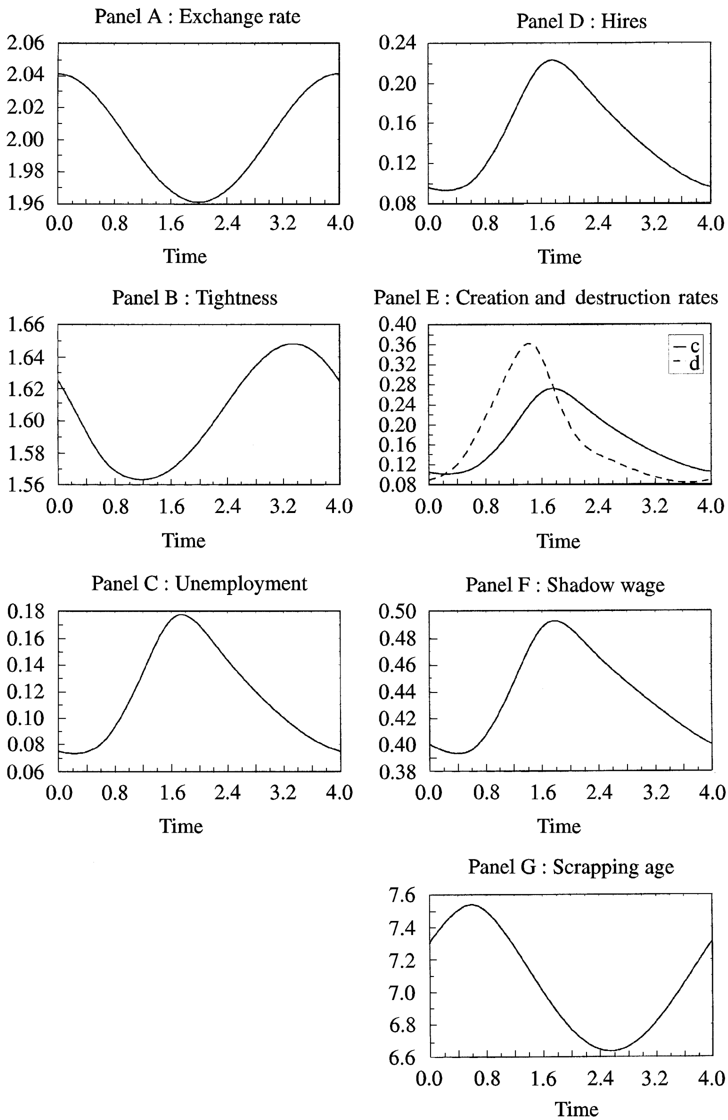

Fig. 1. Cyclical response.

Panel D reports new hires. Observe that hires also increase quite abruptly before the appreciation peak, in response to two compounding factors. First, hires increase with unemployment through the matching function. As unemployment increases, it becomes easier to fill out vacancies and this will mechanically increase hires. However, this effect is supplemented by the increase in posted vacancies evident in the increase in the tightness coefficient.[22]

Panel E reports job creation and destruction rates. A few points are worth noting. First, job destruction is endogenous and responds strongly to fluctuations in the real exchange rate. In the simulation, the job destruction rate reaches 38% of employment at its maximum.[23] Second, creation and destruction are tightly synchronized, a point already noted in a similar setup by Caballero and Hammour (1996a). In the efficient economy, the opportunity cost of reallocation is lowest when p is low, since then unemployed workers lose relatively less. Job destruction will peak around those episodes. Since creation costs decrease with unemployment, it is efficient to bunch entry shortly after the destruction peak, that is, when unemployment is at its largest. This surge in job creation is also associated with a *cleansing* of the productive structure in the traded sector (panel G).[24]

Panels E and G confirm that the synchronization of creation and destruction leads to a substantial *within* sector reallocation, around the peak of the appreciation episode. Moreover, the scrapping age keeps falling until after the exchange rate starts depreciating. Better times, as measured by a depreciation of the currency, are better times for everybody: old and new production units alike. However, newer units also benefit from access to better technologies. High demand for workers pushes up the shadow wage, and finishes pruning old and obsolete production units out of business.

Lastly, after a brief initial decline, the shadow wage increases steadily while the currency is appreciating (panel F). Increased unemployment and a decline in hiring are not enough to lower the shadow wage (hence the actual wage paid by firms).

To summarize, net exit occurs mostly during the appreciation phase and is largely driven by job destruction, with job creation playing a more passive role. Destruction increases as the opportunity cost of reallocating workers falls. This creates a large pool of unemployed workers willing to find a job in the traded sector. In turn, this plants the seed for the subsequent increase in hiring.

3.3.2. *Impulse response*

This subsection investigates the response to an unanticipated change in the exchange rate. This is a technically challenging problem to solve. The reason for this difficulty is the following. The vacancy rate is a non-predetermined variable.

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[22] One can observe that posted vacancies have to increase faster than unemployment, given that both u_s and θ_s increase and $\theta_s = v_s/u_s$.

[23] Clearly, there is no attempt at calibration here.

[24] The patterns for the inefficient economy are very similar and are not reported. If workers receive a higher (lower) share of the surplus, employment in the traded sector is lower (larger). Inefficiencies in β or η affect the magnitudes, not the timing.

Following a sudden change in prices, the vacancy rate will immediately adjust so as to put the economy back on the 'stable manifold'. Second, determining by how much vacancies adjust requires solving for the endogenous forward-delay T_s. After a change in price, new entrants should foresee the revised exchange rate path and set the lifetime expectancy of the unit accordingly. From Eq. (14c) it is clear that this will depend on the shadow cost of labor at the time the production unit is scrapped, which in turn depends on entry conditions at that future time… It is possible, however, to solve this problem graphically under one additional assumption. In this subsection, I look at the response to an unanticipated step appreciation of the exchange rate that lasts t_0 periods before reverting to the original exchange rate p_0.[25] I further assume that production unit's lifetime expectancy remain unchanged.[26] The system before the shock is in steady state with a constant scrapping age, tightness ratio and unemployment rate. As a result, lifetime expectancy remains set at $\bar{T}$. The system can be rewritten in terms of only two variables, θ and u:

$$v\eta(\theta_s)\frac{\dot{\theta}_s}{\theta_s q(\theta_s)} = \beta\theta_s v + (1-\beta)\left(\frac{z}{p_s} - 1 + \frac{\gamma}{r+\delta}(1 - \mathrm{e}^{-(r+\delta)\bar{T}})\right) + (r+\delta-\gamma)\frac{v}{q(\theta_s)}, \tag{15a}$$

$$\dot{u}_s = \delta(L - u_s) - u_s\theta_s q(\theta_s) + (1 - \dot{a}_s)u_{s_{a_s}}\theta_{s-a_s}q(\theta_{s-a_s})\mathrm{e}^{-\delta a_s}, \tag{15b}$$

where

$$\dot{a}_s = \frac{-\beta}{1-\beta}\frac{v}{\gamma}\frac{\dot{\theta}_s}{\tilde{w}_s} \quad \text{and} \quad \mathrm{e}^{-\delta a_s} = \tilde{w}_s^{\delta/\gamma} = \left(\frac{z}{p_s} + \frac{\beta}{1-\beta}v\,\theta_s\right)^{\delta/\gamma}. \tag{15c}$$

This system is saddle-path stable, with the stable arm corresponding to the $\dot{\theta} = 0$ Eq. (14a). The phase diagram is reported in Fig. 2 with solid lines.

A sudden appreciation of the exchange rate at time t for t_0 periods shifts both curves as indicated in Fig. 2 with the dashed lines. First, the $\dot{\theta} = 0$ schedule shifts down as a lower tradable price lowers the number of vacancies immediately. Second, the $\dot{u} = 0$ schedule shifts to the right. To see this, note that at a given tightness ratio, a lower tradable price tends to push old production units over the edge and lower the scrapping age. To maintain the equilibrium between job outflows and inflows, the unemployment rate must increase.

[25] The solution to a persistent impulse of the type $p_t = p_0 + \varepsilon\mathrm{e}^{-bt}$ is very similar conceptually but more difficult to present graphically. Most of the following results apply also in the case of a gradual return to equilibrium.

[26] This approximation allows to eliminate the endogeneity of the forward-delay and simplifies drastically the problem. Note that this assumption is unlikely to matter much if $\bar{T} \gg t_0$. The fluctuation in T_s is then of second order over the lifetime of the existing plants.

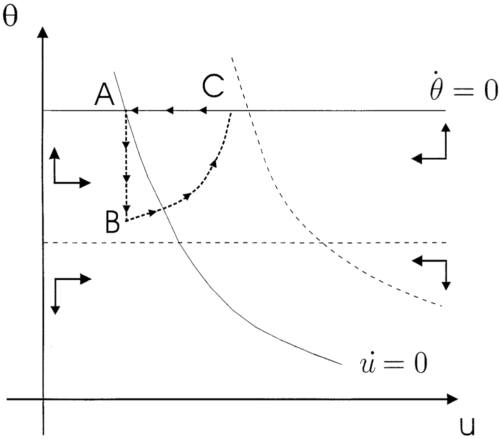

Fig. 2. Phase diagram: Unanticipated appreciation.

The dynamics are as follows: from point A, labor market tightness jumps down while initially unemployment remains unchanged (point B). The economy does not jump all the way to the new saddle path $\dot{\theta} = 0$ since it is known that the exchange rate will eventually revert to its initial value. Instead, tightness falls to point B and the economy starts moving along the $B - C$ curve: unemployment and θ increase as higher unemployment lowers relative creation costs. At time $t + t_0$ the economy finds itself at point C and θ remains constant while unemployment falls back steadily to its original value. The interesting part of this exercise consists in deriving the gross flows that underly these net employment changes. To see what is happening, let start by considering the behavior of the scrapping age a_s. Differentiating totally Eq. (15c) one can see that on impact

$$\mathrm{d}a < \frac{z}{\gamma p^2}\left[\frac{(r+\delta-\gamma)\eta v \theta^{\eta-1}}{(r+\delta-\gamma)\eta v \theta^{\eta-1} + \beta v}\right] \mathrm{e}^{\gamma a}\mathrm{d}p < 0$$

so that the scrapping age decreases immediately: units that were marginally productive are now unprofitable and are immediately scrapped.[27] Moreover, since immediately after the jump the economy is at point B where $\dot{\theta} > 0$, we also have from Eq. (15c) that $\mathrm{d}\dot{a} < 0$: the scrapping age keeps decreasing. This results in a wave of job destruction at time 0. Simultaneously, job creation falls since

[27] To derive this inequality, note that the right-hand side is the change in scrapping age that would result if θ were to jump to the new $\dot{\theta} = 0$ curve. Since θ adjusts less (to point B), the scrapping age must fall by more.

new hires $h = \theta q(\theta)u$ decrease as fewer vacancies are posted. On impact therefore, the gross flows are moving in opposite directions. Note further that job destruction is more responsive than job creation since all production units older than $a_s|_{s=t^+}$ are scrapped. Fig. 3 traces out the behavior of tightness, unemployment, hires, shadow wages, job creation and destruction following the shock.

The time path of θ and u (panels B and C) is directly derived from the phase diagram. From these, the behavior of new hires $h = u\theta q(\theta)$ follows (panel D). Hires fall initially as it becomes unprofitable to hire new workers. Following the shock, hires increase unambiguously since unemployment increases and tightness also increases. In $t + t_0$, the tightness level is back to its steady-state value but unemployment remains high and therefore hires are also higher than their steady-state value and start declining as unemployment falls.

The pattern of job creation (panel E) mimics the behavior of hires. Job destruction jumps up since the scrapping age falls immediately. Subsequently, job destruction keeps increasing as the scrapping age keeps declining and unemployment increases. Eventually, as new hires fall, exiting cohorts become thinner and thus reduces job destruction. This echo effect from the creation to the destruction is essential in the return to equilibrium. Job destruction then falls below its steady-state value before converging back to equilibrium.[28]

The picture that emerges is one where large numbers of jobs are initially destroyed before job creation eventually picks up. A faster adjustment to the shock would occur if the shadow wage were to fall rapidly, inducing domestic firms to hire workers. However, panel F demonstrates that the shadow wage jumps up initially and keeps increasing as long as the currency remains appreciated. The direct effect of the appreciation is an increase in the shadow wage through higher unemployment benefits in terms of tradable (z/p). This cost increase is only partially offset by a fall in vacancies. Higher benefits increase the outside opportunities of the workers and lowers the surplus from the match. In effect, workers are more effective at appropriating the surplus of the match. The resulting increase in unemployment is the general equilibrium mechanism that ensures that employers can recoup their entry costs. Even though wages are fully flexible, they fail to adjust downwards sufficiently in response to an appreciation. This form of 'covert' rigidity has been emphasized by Caballero and Hammour (1996) and results from the contractual inefficiency that allows workers to appropriate part of the match-specific investment sunk by the

[28] Under some set of parameters, it is actually possible for job destruction to converge to its steady state value from above. Of course, it must always be the case that the integral of the difference between job creation and destruction is zero. Note also that the behavior of the scrapping age is nontrivial. This is so since Eq. (15c) may fail to hold continuously. The reason for this is that it might now be optimal for firms to remain in business today while earning 0 flow revenues, knowing fully well that the exchange rate will adjust up tomorrow. As a result, it is no longer true that firms exit as soon as the flow profits are zero.

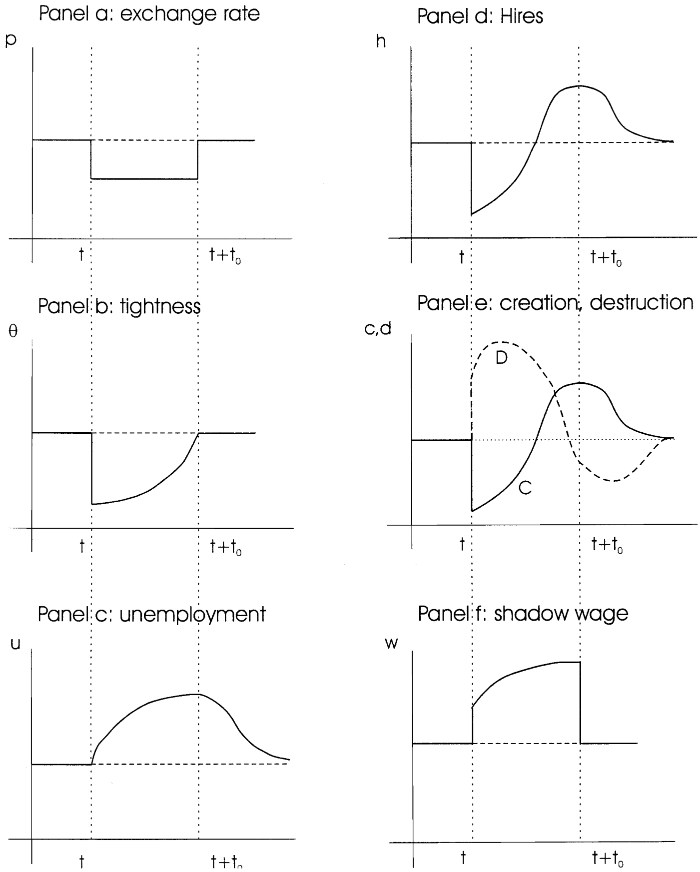

Fig. 3. Impulse response: Transitory appreciation.

employer. This indicates in particular that competitive disinflation policies can be very unsuccessful at moderating wages.[29]

3.4. Final remarks

Comparing the results in Fig. 3 with Fig. 1 a few points emerge:

- The response to unanticipated changes in the exchange rate is front-loaded: a substantial fraction of the adjustment takes place immediately.

[29] In the limit case of a permanent appreciation of the currency, recall that the steady state displays a higher shadow wage in terms of tradable, and higher unemployment. The limit case of a permanent appreciation is not the limit as $t_0 \to \infty$ since eventually T must adjust to its new, lower, steady-state value.

- Unanticipated shocks triggers opposite initial movements in creation and destruction: there is less opportunity for judicious 'timing' when action must occur immediately.
- For both anticipated and unanticipated fluctuations, the shadow wage exceeds its steady state value during the appreciation phase. Despite the increase in unemployment, insiders benefit unambiguously from the appreciation.

These results point to the strong intertemporal substitution motive built in the model: given a chance to anticipate exchange rate movements, employers will 'bunch' entry and exit decisions. However, unanticipated persistent changes force them to liquidate immediately unproductive units.

4. The case of France

In this section, I investigate empirically the response of employment gross and net flows to exchange rate fluctuations in the French economy between 1984 and 1992. The evolution of France's exchange rate policy over this period is quite interesting. Starting in 1983 and the 'tournant de la rigueur', France aimed at a disinflation policy whose overarching element was a commitment to peg the Franc to the Deutschemark. This radical shift in strategy resulted in 1987 in a full commitment to the DM–FF exchange rate, in what came to be known as the 'competitive disinflation' strategy. This policy has been followed until now, even through the rough summer of 1992 and early 1993 when speculative attacks against a number of European currencies forced the widening of the ERM bands to 15%. Over the 1987–1992 period, this implied a full alignment of French monetary policy on its German counterpart aimed at limiting fluctuations in the FF–DM nominal exchange rate.

As discussed in the introduction, issues of exchange rate endogeneity can be quite severe. First, the exchange rate may be affected by shifts in domestic or foreign monetary policy. Second, the Banque de France itself will react to movements in the exchange rate. Assume that Germany is France's sole trading partner. This paper's identification strategy relies on autonomous movements in the *nominal* exchange rate as a source of reallocation shocks. When the central bank maintains a fixed exchange rate, these reallocation shocks are absorbed through movements in domestic interest rates or credit to the domestic economy. In turn, changes in interest rates or open market operations induce aggregate and reallocative effects, so that exchange rates fluctuations would have no explanatory power in an empirical specification.

I address these problems in the following way. First, I will directly allow for monetary policy and aggregate shocks as explanatory variables. Second, using industry-based real exchange rates, identification will obtain from the cross section of industries. Lastly, the problem is likely to be less severe for industries trading mostly with countries whose currency is not pegged to the French Franc. With a slight abuse of notation, I refer to these industries as the 'non-ERM' industries. Looking at the numbers, it appears that Germany attracted about 10.06% of French exports and represented 15.72% of its imports, using data for 1986–1992. More broadly, 42% of French exports (resp. 52% of its imports) go to (resp. come from) countries whose currency is also pegged to the French Franc. In turn, the US and OECD countries outside the European Union represent respectively 5.79% (16.24%) of exports and 7.8% (18.8%) of imports. These numbers indicate that a small but non-negligible share of trade involves countries whose currencies is more likely to fluctuate vis-à-vis the French Franc. A better measure of the exposure to exchange rate fluctuations is the effective exchange rate compiled by the IMF.[30] Fig. 4 presents the log of the nominal FF–DM exchange rate (left panel) as well as the log of the effective nominal exchange rate (right panel). One observes that the nominal effective exchange rate appreciated on average by 1% a year between 1984 and 1992, despite the relative constancy of the DM–FF rate. This suggests that, over this period, nominal fluctuations between the DM and other currencies could potentially have affected French job reallocation.

4.1. The data

4.1.1. French flows

To measure the effect of exchange rate fluctuations, I look both at net and gross employment changes using annual disaggregated data at the four-digit level. Net employment changes reflect intersectoral reallocation of factors, while changes in gross flows capture within sector reallocation.

I use extremely disaggregated sectoral data on job creation and job destruction tabulated by the French statistical agency, INSEE, through the Base d'Analyse Longitudinale (BAL), at the four-digit level (NAP600). The INSEE data covers French industrial, commercial and service firms from 1984 to 1992. There are important differences between the BAL and its more famous counterpart, the US Longitudinal Research Database (LRD) maintained by Census. Three points are worth noting. First, the BAL's unit is the firm as the company-legal unit, not the plant as in the LRD. To the extent that firms are likely to carry commercial and industrial operations in different industries, the disaggregated BAL sectoral flows will not be as accurate as their LRD counterpart. Changes in the main activity (defined by value added or employment) of a firm will induce a sectoral reclassification and an associated job creation and destruction. Second, the BAL, unlike the LRD, does not correct for breaking continuity of companies due to mergers and acquisitions. Lastly, the BAL covers all sectors

[30] Series neu from the International Financial Statistics database.

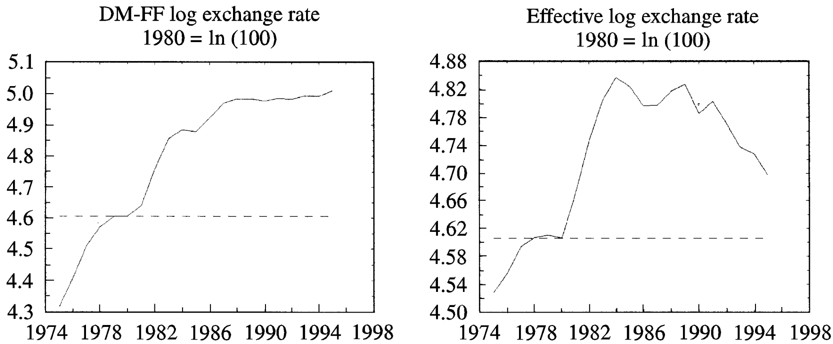

Fig. 4. DM-FF nominal exchange rate and nominal effective exchange rate. All series in logs. Source: IFS.

except financial services and real estate while the LRD covers exclusively manufacturing.[31]

In this paper, I focus on manufacturing industries for two reasons. First, this eases the comparability with the US data. Second, I have no direct data on exports or imports for commercial and service firms.[32] Fig. 5 reports the job creation and destruction rates for selected two-digit industries.[33]

These figures reveal substantial heterogeneity in the gross flows. Chemicals (NAP 17) and Glass (NAP 16) experienced substantial increases in job destruction in 1984 and 1984–87 respectively. By contrast, Drugs (NAP 19) seems to have experienced a steady growth, with job creation consistently outpacing job destruction. This heterogeneity reflects the diverse trajectories of industries at different stage of their product cycle.

The annual average job creation and destruction rates for the French economy are equal to 14.22%. The same figures for manufacturing are 11.58% (creation) and 13.59% (destruction). Manufacturing employment declined at roughly 2% a year over the sample period. By comparison, the US figures for manufacturing are equal to 9.1 and 10.3%.[34] While it is possible that the French gross flows exceed their US counterparts, the discrepancy is more likely to reflect the biases in the French data.

[31] For additonal details on the BAL, see Parent (1995) and Boccara (1997).

[32] In addition, I exclude from the sample Agriculture, Fishing and Wood, and Lumber for lack of coverage.

[33] The description of the sectors is given in Table 1. Job creation and destruction rates are constructed as in Davis and Haltiwanger (1990): $JC_{st} = 2\sum_{i \in s^+} \Delta E_{it}/(E_{st} + E_{st-1})$ where $s^+ = \{i \in s, \text{s.t. } \Delta E_{it} > 0\}$ and $E_{st} = \sum_{i \in s} E_{it}$, and $JD_{st} = 2\sum_{i \in s^-} \{|\Delta E_{it}|\}/(E_{st} + E_{st-1})$ where $s^- = \{i \in s, \text{s.t. } \Delta E_{it} < 0\}$. Firms are assigned to their $t-1$ year sector.

[34] See Davis and Haltiwanger (1990) and Table 2.

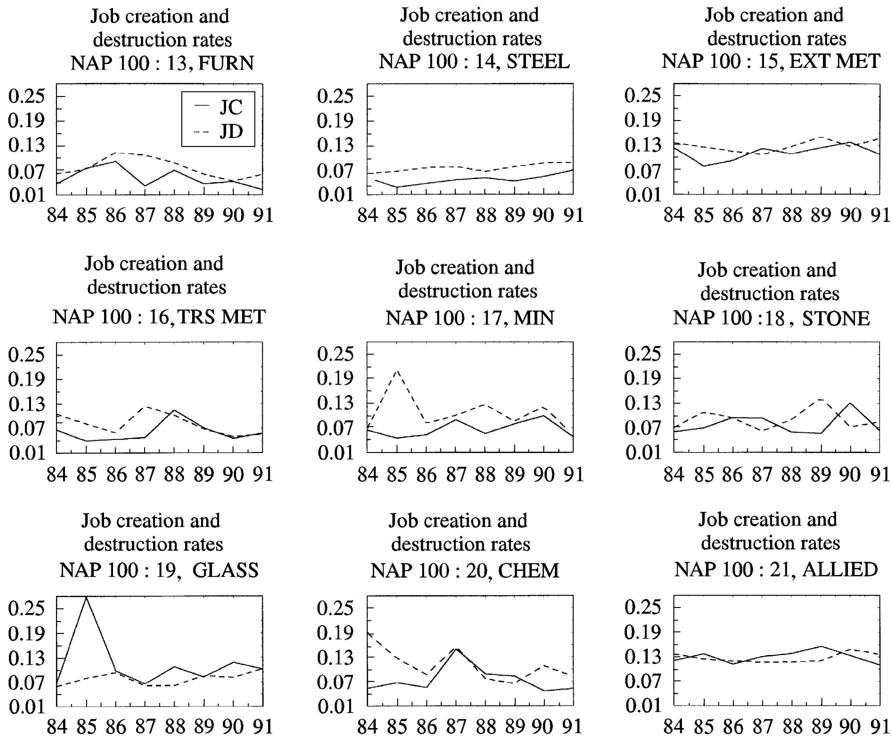

Fig. 5. Job creation and destruction for selected two-digit sectors: 1984–1992.

4.1.2. *Tradable and non-tradable industries*

As in Gourinchas (1998), I first select traded four-digit industries. This exercise aims at measuring the exposure of disaggregated French industries. Campa and Goldberg (1998) identify three distinct measures of exchange rate exposure: export share, import penetration and imported inputs. I abstract from the last measure, which would require use of an input–output table, and concentrate on export shares and import penetration ratio. Using two-digit data on exports, imports and output for 1986 and 1987, I adopt the following operational definition of tradable industries. First, I calculate for each two-digit industry and both years in the sample the export-share and import-penetration ratios. Then, I classify an industry as traded if *either* the export share exceeds 13% *or* the import penetration ratio exceeds 12.5% *in all the years of the sample.* All other sectors are discarded.[35] This selection criterion ensures that sectors

[35] The values for the export shares and import penetration ratios cut-offs are similar to the ones used in Davis et al. (1997) and Gourinchas (1998). The results are mostly insensitive to reasonable changes in the cut-off.

experiencing a transition from very closed to very open or vice versa are excluded from the sample.

Forty-two industries qualify as traded, out of a total of 99 two-digit manufacturing sectors. Tradable industries are further classified as exporters or import-competing according to their export share and import penetration ratios. Out of the 42 traded industries (with a substantial overlap), 34 are classified as exporters and 36 as import-competing industries. The list of industries with their NAP code, average export share, import penetration and average job creation and destruction rates is reported in Table 1.

Looking at the table, a few points emerge. First most French manufacturing sectors are quite open to international competition, as reflected in the small number of non-traded industries and the large export shares and import penetration ratios.[36] Second, as already noted, there is a large disparity in terms of average job creation and destruction over the sample period. Few sectors have a positive net employment gain over the period. By contrast, employment decreased sharply over the sample period in numerous industries. Primary Metal (NAP 9–12), Base Chemicals (NAP 17), Farm Machinery (NAP 22), Non electrical household appliances (NAP 30), Motor Vehicles (NAP 31), Fabric Mills (NAP 43) and Footwear and Apparel (NAP 46 and 47), have experienced a decline in average employment in excess of 3% per year.

Fig. 6 reports the job creation and destruction series, aggregated for various sectors. The upper left figure reports the job creation (solid) and destruction (dashed) rates for all industries and production activities recorded in the dataset. Despite the contraction in manufacturing, this figure illustrates that numerous jobs were created in other parts of the economy. Creation and destruction rates increased substantially from 1986 to 1990, then dropped precipitously. The net gain is positive in 1986–1987 and from 1989 to 1991. By contrast, job destruction exceeds job creation in the manufacturing, traded and non-traded sectors, indicating a rapid net reallocation of jobs away from these industries. Table 2 presents some additional information on gross flows. Unlike the US data, French job destruction does not appear systematically more volatile than job creation, except possibly for nontraded sectors.

4.1.3. Sectoral real exchange rates

The driving force in the model is the price of traded goods relative to the unemployment benefits, or alternatively, relative to the price of nontraded goods. One could therefore think of measuring directly the relative price of tradable in terms of nontradable, using sector specific output prices and a classification of sectors into traded and non-traded. However, besides the obvious

[36] For the purpose of the table, non-traded industries are defined as industries with export share *and* import penetration below 1% in all years in the sample.

Table 1
NAP100 classification: Non-traded, exported and import competing

Code		Non-traded	Export	Import	Export share	Import pen.	Average flows	
							Creat.	Dest.
4	Coal			×	5.93%	18.68%	0.55%	11.86%
5	Petroleum and gas prod.			×	9.44%	31.57%	3.61%	7.81%
6	Elec. prod. and dist.	×			2.61%	0.54%	0.71%	1.40%
7	Gas dist.	×			0.18%	0.13%	1.08%	2.09%
8	Water dist.	×			0.00%	0.01%	5.86%	3.53%
9	Ferrous metals			×	7.99%	73.98%	8.20%	14.86%
10	Blast furnaces		×	×	23.83%	19.19%	9.48%	27.65%
11	Primary transf. steel		×	×	49.14%	31.93%	5.68%	17.62%
12	Ext. non ferrous metals		×	×	12.28%	55.25%	5.66%	15.06%
13	Prim. transf. non-ferrous met.		×	×	27.64%	31.17%	4.97%	7.42%
14	Prod. misc. min.			×	18.00%	31.62%	4.63%	7.40%
16	Glass		×	×	32.41%	24.15%	6.01%	8.02%
17	Chemical, exc. plast. mat.		×	×	48.17%	34.79%	6.69%	10.61%
18	Allied products		×	×	37.58%	18.31%	7.83%	9.03%
19	Drugs		×		22.58%	6.58%	11.50%	7.75%
21	Metalwork		×	×	19.81%	17.00%	12.92%	12.70%
22	Farm mach.		×	×	41.55%	33.51%	10.11%	15.28%
23	Machine tools		×	×	87.70%	58.97%	11.20%	12.88%
24	Ind. equ.		×	×	71.79%	39.60%	12.02%	12.65%
25	Mining, const, met. work. mach.		×	×	84.58%	38.68%	9.27%	13.05%
27	Office, comp. mach. and mat.		×	×	72.26%	46.34%	8.44%	8.84%
28	Elec. mach.		×	×	47.32%	21.00%	10.97%	11.86%
29	House. & prof. elec. appliances		×	×	39.14%	25.66%	11.10%	15.05%
30	Non elec. house. appliances		×	×	35.77%	32.31%	4.93%	9.05%
31	Motor vehicles		×		24.64%	12.86%	3.91%	7.83%
33	Aircraft and parts		×	×	86.47%	21.97%	3.85%	5.94%
34	Measuring and cont. inst.		×	×	70.56%	36.21%	10.41%	11.05%

36	Dairy industry		×		9.97%	4.31%	8.74%	12.20%
37	Canned food		×	×	14.07%	29.38%	12.53%	11.11%
38	Bakery	×					22.52%	21.35%
39	Grain milling		×		10.85%	7.53%	9.32%	11.14%
40	Misc. food and kindred prod.		×	×	20.18%	19.59%	9.82%	12.61%
41	Beverages		×		24.01%	6.54%	9.18%	11.86%
42	Tobacco			×	2.98%	7.96%	36.95%	40.78%
43	Broad woven fabric mills		×	×	33.36%	49.78%	2.72%	10.20%
44	Textile mill, exc. fabric mills		×	×	51.70%	42.30%	9.27%	14.54%
45	Leather prod., exc. foot.		×	×	63.78%	46.78%	11.91%	15.93%
46	Footwear		×	×	43.14%	50.63%	6.21%	13.13%
47	Apparel		×	×	41.82%	34.16%	13.70%	18.84%
48	Wood fixtures			×	15.78%	18.97%	13.12%	14.42%
49	Wood furnitures			×	17.42%	21.40%	13.99%	16.26%
50	Paper and allied products		×	×	16.19%	22.52%	8.51%	9.62%
52	Rubber and misc. prod.		×	×	31.11%	19.72%	4.58%	6.89%
53	Plastic mat.		×	×	23.67%	27.24%	12.70%	10.81%
54	Misc. ind.		×	×	68.03%	41.90%	13.30%	15.09%
55	Const.	×					17.92%	18.37%
56	Recycling		×		23.30%	11.66%	17.61%	17.83%

Average export share, import penetration, job creation and destruction. Source: INSEE, BAL and Douanes. Calculations by the author.

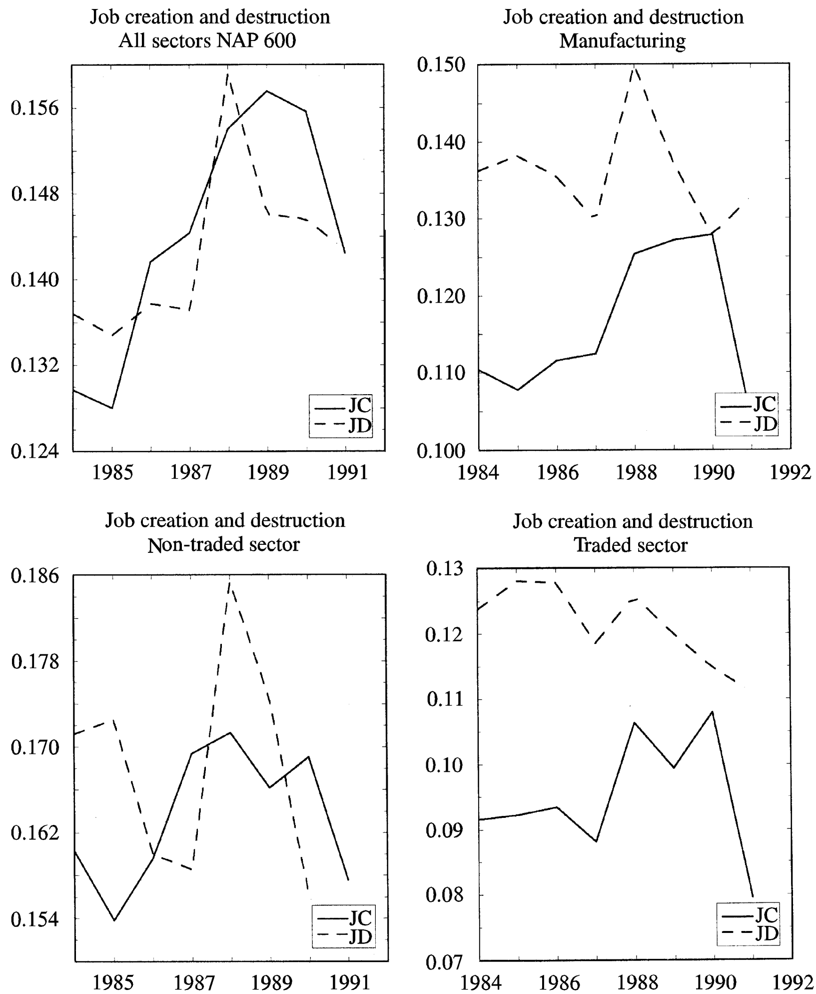

Fig. 6. Job creation and destruction: total, traded, exporters, import competing and non-traded. See text for definitions.

difficulty in constructing relative sectoral prices, the major source of real exchange rate fluctuations comes from adjustments in the nominal exchange rate. This paper directly constructs a sector-specific real exchange rate, using two-digit data on exports and imports by country of origin/destination for 1986–1987. For each of the selected four-digit sectors, a log-real exchange rate is defined as a weighted average of the WPI-based log-real exchange rate against

Table 2
Gross flows by job sectors

Sector	Job creation				Job destruction			
	Mean	Standard deviation	Min.	Max.	Mean	Standard deviation	Min.	Max.
Total	14.42	1.13	12.80	15.76	14.25	0.80	13.48	15.92
Manuf.	11.58	0.96	10.34	12.79	13.59	0.67	12.77	14.99
Non-traded	16.34	0.64	15.38	17.13	16.61	1.15	15.12	18.54
Traded	9.48	0.94	7.95	10.79	12.12	0.62	11.10	12.81
Exporters	9.40	0.94	7.80	10.62	11.97	0.67	10.92	12.82
Import-comp.	9.42	0.97	7.87	10.73	12.20	0.71	11.13	12.95
	Excess reallocation				*Net employment growth*			
Total	28.01	1.75	25.60	30.81	0.17	0.76	− 0.71	1.15
Manuf.	23.15	1.91	20.69	25.54	−2.01	1.05	− 3.03	0.00
Non-traded	31.92	1.31	30.24	34.26	−0.28	1.20	− 1.87	1.31
Traded	18.96	1.88	15.90	21.58	−2.64	0.99	− 3.58	− 0.69
Exporters	18.80	1.88	15.61	21.24	−2.57	0.99	− 3.54	− 0.73
Import-comp.	18.83	1.94	15.73	21.46	−2.79	1.03	− 4.07	− 0.84
	Employment share							
Non-traded	13.58	0.20	13.31	13.87				
Traded	32.69	1.83	30.42	35.48				
Exporters	30.49	1.63	28.47	32.97				
Import-comp.	30.25	1.73	28.09	32.90				

Source: Gross flows from INSEE, BAL; and author's calculations.

that sectors' major trading partners.[37] Fig. 7 reports the export-based real exchange rate index for selected two-digit industries.

There is a broad similar pattern in all sector-based real exchange rate, with a significant appreciation of the Franc over the sample period. Note however, that the individual trajectories differ from industry to industry. For instance, Farm Machinery (NAP 22) experienced a substantial depreciation between 1988 and 1991, while Chemical (NAP 17) appreciated steadily. This sectoral variation will help identification.

[37] The major trading partners are defined by calculating the average export/import shares of total export/import for each industry and destination/origin country. Country i is considered a major trading partner for sector j if either (1) country i is among the largest trading partners accounting for 50% of exports/imports for sector j or (2) trade with country i represents more than 10% of exports/imports, on average over the sample period. The real exchange rate was then constructed as a log average using export/import shares as weights. For each industry, the real exchange rate was normalized to equal 100 (in level) in 1987:4. Data on WPI and nominal exchange rates was obtained from the International Financial Database.

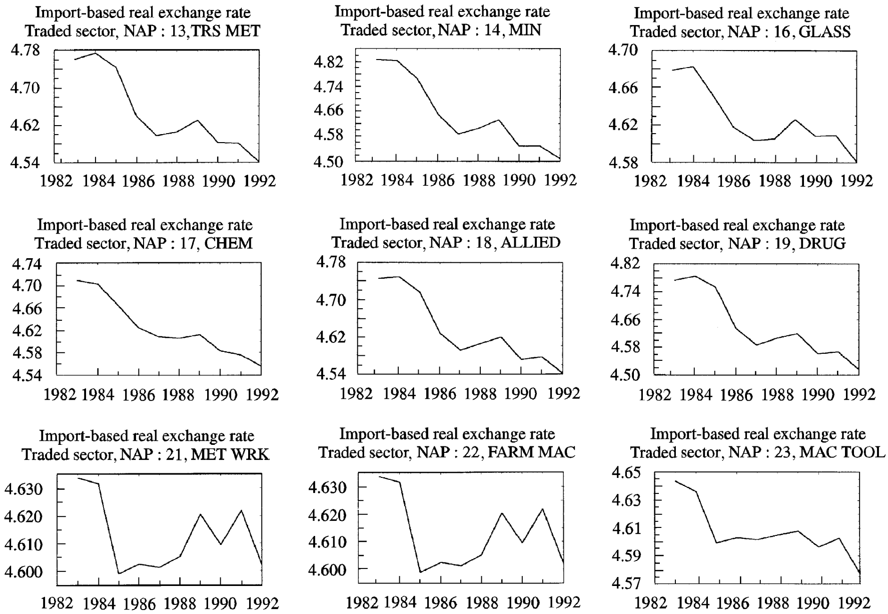

Fig. 7. Two-digit real exchange rate: 1988 = ln 100.

4.2. Results

The model presented in the theoretical section suggests that (1) tradable employment growth decreases, the further the currency appreciates (2) destruction will be more responsive than creation, (3) creation and destruction commove positively in response to anticipated exchange rate movements, or commove negatively following unanticipated changes and (4) reallocation is concentrated around expected appreciation episodes.

To investigate these predictions, I start by looking at net employment changes and propose the following specification:

$$\hat{E}_{it} = \alpha_i + \beta(L)\lambda_{it} + \gamma(L)Z_t + \varepsilon_{it}\,, \tag{16}$$

where $\hat{E}_{it}$ is net employment growth in industry i between time t and $t+1$, and λ_{it} is the industry-specific log real exchange rate at the end of period t, measured in deviation from an industry-specific trend. The first thing to notice is that the real exchange rate is already lagged once so as to reduce the possibility that changes in net employment affect relative prices. Z_t contains aggregate variables likely to influence both the real exchange rate and employment growth. The response to λ will only capture that part that is not explained by Z_t. I include in Z_t total manufacturing employment growth between time t and time $t+1$, $\hat{E}_t$, to capture the effect of aggregate shocks, the French 3 months T-bill rate i_t, as well as the US Federal Fed fund rate FF_t. The domestic interest rate controls for the possibility that exchange rate movements might result from shifts in domestic monetary policy. The US Federal Funds rate ensures that the effect of exchange rate movements is not simply due to the aggregate demand impact of a US monetary contraction.[38] $\beta(L)$ and $\gamma(L)$ are lag polynomials and α_i a sector-specific constant. The coefficients are allowed to vary across groups: traded, exporters and import-competing. The results are presented in Table 3, Panel A.

Under the null hypothesis that all variations in employment growth are unrelated to currency fluctuations, the real exchange rate should have no explanatory power. To the contrary, I find that a depreciated real exchange rate (a high value of λ) is associated with substantially higher employment growth in tradable. Table 3 indicates that a modest 1% real appreciation leads to a decline in tradable employment of roughly 0.95% over the course of the next two years. The coefficients on manufacturing employment growth also indicate that traded industries are very sensitive to aggregate shocks, with a 1% increase in manufacturing employment increasing tradable employment by 7.6%. Most of this adjustment seems to occur through changes in the import-competing sector, with a relatively less sensitive export sector.

To put things into perspective, it is useful to look at the implied employment changes with the following back of the envelope calculation. French manufacturing employment represents roughly 6 millions workers and tradable employment accounts for about 60% of that total. The results indicate that a 1% across the board real appreciation can eliminate up to 35,000 jobs in the tradable sector over the following two years. This is quite a large response for such small change in the real exchange rate.[39]

The French interest rate is significant, with a 1% increase in interest rates reducing tradable employment by 3.83% the following year. Lastly, the US federal fund rate does not appear to influence net employment fluctuations.

It is useful to compare the results with the US case. In Gourinchas (1998), I found that a 1% appreciation of the real exchange rate decreases tradable employment by only 0.027% over the next three quarters. French jobs appear much more sensitive to currency movements than US jobs.

Panel B presents similar results using a subset of industries trading mostly with countries whose currency is not pegged to the French Franc. I refer to this

[38] I also experimented with the German T-bill rate but the results were mostly unchanged. Note that the short time span of the dataset severely limits the possible dynamic specifications.

[39] The panel regression imposes identical responses to monetary policy and aggregate shocks, across industries. Consequently the real exchange rate variable will pick-up any cross-sectional variation. If monetary policy or aggregate shocks have, as is probably likely, reallocative as well as aggregate effects, some of the response to exchange rate shocks might be spuriously attributed to currency movements.

Table 3
Employment response to real exchange rate deviations: employment growth

Sector		Traded					
Reg.		All		Exports		Import	
	Timing	Coeff.	SE	Coeff.	SE	Coeff.	SE
Panel A: Full sample							
λ_{it}	1 lag	0.97**	0.23	0.28	0.19	0.99**	0.25
	2 lags	− 0.01	0.17	0.31**	0.13	− 0.04	0.18
	Sum	0.95**	0.30	0.59**	0.24	0.94**	0.31
$\hat{E}_t$	Cont.	3.57**	1.58	1.54	1.21	3.71**	1.69
	1 lag	4.02**	1.26	2.46**	0.96	3.97**	1.35
	Sum	7.60**	2.67	4.00*	2.04	7.68**	2.84
i_t	1 lag	− 3.83**	1.41	− 1.83	1.09	− 3.92**	1.48
FF_t	1 lag	− 0.38	0.41	0.31	0.30	0.49	0.44
Obs.		1620		1487		1476	
Groups		271		248		247	
SS (10^3)		51.38		23.51		50.19	
F-stat		3.80	(0.001)	1.95	(0.07)	3.38	(0.003)
Panel B: Non-ERM industries							
λ_{it}	1 lag	0.48	0.30	0.74**	0.34	0.52	0.37
	2 lags	0.04	0.16	0.21	0.17	− 0.04	0.21
	Sum	0.53	0.40	0.94*	0.47	0.48	0.49
$\hat{E}_t$	Cont.	3.50	3.37	9.20**	3.55	1.86	4.39
	1 lag	4.02	2.82	8.57**	3.01	2.66	3.67
	Sum	7.53	5.97	17.76**	6.40	4.52	7.73
i_t	1 lag	− 3.55	3.17	− 7.37**	3.32	− 2.81	4.17
FF_t	1 lag	− 0.64	0.64	− 0.20	0.58	1.49	0.89
Obs.		848		690		512	
Groups		142		115		86	
SS (10^3)		29.69		14.70		22.17	
F-stat		0.97	(0.44)	2.03	(0.06)	1.33	(0.24)

Note: The table shows the response of employment growth to changes in the real exchange rate in the traded sector (λ), manufacturing employment growth ($\hat{E}$), 3 months French Treasury Bill rate i_t and the US T-bill FF_t. The coefficients are constrained to be equal across all 4-digit sectors, except for a constant (not shown). Observations are annual, from 1984 to 1992. ** denotes coefficient significant at the 5% level. * denotes coefficient significant at the 10% level. Real exchange rate: author's calculations; T-bill and Fed Funds from IFS line 60CS and Citibase line FYFF respectively.

group, with a slight abuse of notation, as the 'non-ERM industries'.[40] The traded sector includes 22 two-digit industries, 16 exporting and 15 import-competing. The first thing to note is that the regressions have almost no explanatory power, except for the exporting sector. While the point estimates have the expected sign, the low F-statistics indicate that the noise is substantially higher. The smaller dataset joint with the limited time-span may have reduced the power of the regressions. 'Non-ERM' export industries expand when the currency depreciates and contract when domestic interest rates rise.

The results so far indicate some *intersectoral* job reallocation in response to exchange rates, although the evidence on 'non-ERM' industries is much weaker.

Tables 4 and 5 report the results from a similar specification applied to gross job creation and destruction respectively. As amply discussed in the theoretical section, a given increase in net employment could result from a synchronized increase/decrease in gross flows, or opposite movements in each margin.

One observes first that job creation and destruction respond substantially to exchange rate movements. A 1% appreciation of the currency simultaneously decreases creation by 0.71% and increases destruction by 0.24%. Quite surprisingly, it appears that the creation margin is much more sensitive to currency movements than job destruction. This is also true in response to aggregate shocks: an additional 1% manufacturing employment growth increases job creation by 3.99% and lowers job destruction by 3.60%.

Recall that the average annual job creation and destruction flows for the traded sector are 9% and 12%, respectively. The implied changes in response to reallocation or aggregate disturbances are thus substantial. Domestic monetary policy has the expected sign with a higher interest rate triggering opposite movements in creation and destruction.

Lastly, one observes that most of the action is coming from import competing industries. In particular, job destruction and creation in export competing industries appear quite unresponsive to exchange rate movements. One possibility, that is left for future research, is that exporters face higher entry costs than import competing industries. If this is the case, then one would expect both margins to remain inactive following exchange rate movements.

By contrast, the US results presented in Gourinchas (1998) indicate that US firms engage in substantial bunching, with job creation and destruction simultaneously decreasing when the currency depreciates and rising when the currency appreciates. As in the model outlined above, appreciations are times of 'churn' while depreciation are times of 'chill'. One possible interpretation of the results is

[40] The list is defined by excluding exports to and imports from the following countries: Belgium, Luxemburg, Netherlands, Germany, Ireland, Denmark, Greece, Portugal, Spain, Sweden and the CFA countries (Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Congo (Brazzaville), Cote d'Ivoire, Equatorial Guinea, Gabon, Guinea-Bissau, Mali, Niger, Senegal and Togo).

Table 4
Job creation response to real exchange rate deviations: job creation

Sector		Traded					
Reg.		All		Exports		Import	
	Timing	Coeff.	SE	Coeff.	SE	Coeff.	SE
Panel A: Full sample							
λ_{it}	1 lag	0.52**	0.15	− 0.02	0.13	0.55**	0.16
	2 lags	− 0.18	0.11	0.19**	0.09	0.16	0.12
	Sum	0.71**	0.20	0.17	0.16	0.71**	0.20
$\hat{E}_t$	Cont.	2.04*	1.04	0.69	0.80	1.98**	1.11
	1 lag	1.95**	0.83	0.73	0.64	1.93**	0.89
	Sum	3.99**	1.76	1.43	1.36	3.91**	1.87
i_t	1 lag	− 1.89**	0.93	− 1.23	0.72	− 1.95**	0.97
FF_t	1 lag	0.17	0.27	0.49**	0.20	0.09	0.29
Obs.		1620		1487		1476	
Groups		271		248		247	
SS (10^3)		22.42		10.27		21.81	
F-stat		3.25	(0.004)	2.23	(0.04)	2.82	(0.01)
Panel B: Non-ERM industries							
λ_{it}	1 lag	0.40**	0.19	0.29	0.21	0.42	0.24
	2 lags	0.27**	0.11	0.10	0.10	0.32**	0.14
	Sum	0.66**	0.27	0.39	0.28	0.75**	0.33
$\hat{E}_t$	Cont.	2.59	2.23	4.34**	2.15	1.16	2.92
	1 lag	4.14**	1.87	4.23**	1.83	3.52	2.44
	Sum	6.74	3.95	8.57**	3.87	4.68	5.14
i_t	1 lag	− 3.41	2.09	− 2.86	2.01	− 3.39	2.77
FF_t	1 lag	− 0.25	0.42	− 0.33	0.35	− 0.86	0.59
Obs.		848		690		512	
Groups		142		115		86	
SS (10^3)		13.01		5.42		9.94	
F-stat		1.86	(0.08)	2.70	(0.01)	2.26	(0.04)

Note: The table shows the response of job creation to changes in the real exchange rate in the traded sector (λ), manufacturing employment growth ($\hat{E}$), 3 months French Treasury Bill rate i_t and the US T-bill FF_t. The coefficients are constrained to be equal across all four-digit sectors, except for a constant (not shown). Observations are annual, from 1984 to 1992. ** denotes coefficient significant at the 5% level. * denotes coefficient significant at the 10% level. Real exchange rate: author's calculations, T-bill and Fed Funds from IFS line 60CS and Citibase line FYFF respectively.

that intertemporal substitution in response to French Franc movements is limited. In light of the model discussed above, French employers do not seem to engage in substantial bunching. Indeed, excess reallocation falls when the exchange rate changes. This result may reflect a larger predictability of the industry-specific real exchange rates in the US compared to France.

Table 5
Job destruction response to real exchange rate deviations: job creation

Sector		Traded					
Reg.		All		Exports		Import	
	Timing	Coeff.	SE	Coeff.	SE	Coeff.	SE
Panel A: Full sample							
λ_{it}	1 lag	− 0.44**	0.17	− 0.29	0.16	− 0.44**	0.17
	2 lags	0.20	0.12	0.11	0.11	0.21	0.13
	Sum	− 0.24	0.21	− 0.41*	0.21	− 0.23	0.22
$\hat{E}_t$	Cont.	− 1.53	1.14	− 0.85	1.02	− 1.72	1.21
	1 lag	− 2.07**	0.91	− 1.73**	0.81	− 2.04**	0.97
	Sum	− 3.60*	1.92	− 2.57	1.72	− 3.77	2.04
i_t	1 lag	1.94*	1.01	1.60	0.92	1.96	1.06
FF_t	1 lag	0.56	0.29	0.18	0.26	0.58	0.32
Obs.		1620		1487		1476	
Groups		271		248		247	
SS (10^3)		26.51		16.59		25.80	
F-stat		2.69	(0.01)	1.39	(0.21)	2.20	(0.04)
Panel B: Non-ERM industries							
λ_{it}	1 lag	− 0.08	0.22	− 0.45	0.30	− 0.09	0.27
	2 lags	0.22	0.12	− 0.11	0.15	0.37**	0.15
	Sum	0.14	0.30	− 0.56	0.41	0.27	0.36
$\hat{E}_t$	Cont.	− 0.91	2.51	− 4.85	3.11	− 0.70	3.21
	1 lag	0.12	2.10	− 4.33	2.64	0.86	2.69
	Sum	− 0.78	4.45	− 9.19	5.60	0.15	5.66
i_t	1 lag	0.14	2.36	4.51	2.91	− 0.58	3.05
FF_t	1 lag	0.39	0.47	0.53	0.51	1.63	0.65
Obs		848		690		512	
Groups		142		115		86	
SS (10^3)		16.48		11.09		11.89	
F-stat		0.88	(0.50)	0.50	(0.81)	1.33	(0.24)

Note: The table shows the response of job destruction to changes in the real exchange rate in the traded sector (λ), manufacturing employment growth ($\hat{E}$) 3 months French Treasury Bill rate i_t the US T-bill FF_t. The coefficients are constrained to be equal across all 4-digit sectors, except for a constant (not shown). Observations are annual, from 1984 to 1992. ** denotes coefficient significant at the 5% level. * denotes coefficient significant at the 10% level. Real exchange rate: author's calculations, T-bill and Fed Funds from IFS line 60CS and Citibase line FYFF respectively.

This interpretation is partially reinforced by looking at the 'non-ERM' industries, for whom dollar base trade is relatively more important. While the results remain mostly non significant, it is interesting to note that gross flows become more positively correlated in response to currency movements. This is especially the case for the import-competing industries. A 1% appreciation decreases simultaneously job creation and job destruction, by 0.75% and 0.27% respectively. Unlike the US, however, the destruction margin is less responsive than the creation one.[41]

I now summarize the findings of the paper:

- Net tradable employment growth appear quite responsive to exchange rate movements. A 1% appreciation can destroy up to 35,000 jobs in the tradable sector. This is less so if one restricts the sample to 'non-ERM' industries where the net job loss is only 24,000. Of course, the economy wide net job destruction is likely to be smaller if new jobs are created in the nontradable sector (services, retail, ...).
- This net employment change is brought about through a simultaneous increase in job destruction and decrease in job creation of 0.24% and 0.71%, respectively; The results on 'non-ERM' industries are lower and often not significant with point estimates of 0.14% and 0.66%, respectively.
- Exchange rate movements do not increase the 'churn' of the French economy. In particular, this indicates that the wave of job destruction following the appreciation of the French currency from 1984 to 1992 has not been followed by a secondary wave of job creation. The negative correlation of gross flows in response indicates few opportunities for optimal intertemporal substitution and bunching. Shifts in the French Franc may be largely unanticipated. When restricting the sample to 'non-ERM' currencies, one finds some evidence of bunching in import-competing industries.
- Job creation is substantially more responsive than job destruction, especially in import-competing industries; This is arguably the largest failure of the theoretical analysis and should shift the focus of future discussions towards the dynamic of the entry margin.
- Gross and net flows are less responsive in exporting industries, possibly reflecting the existence of larger entry costs.
- Aggregate shocks and domestic monetary policy variable have a substantial impact on gross and net flows. Positive aggregate shocks increase job creation and reduce job destruction while the opposite is true for monetary policy.

5. Concluding remarks

This paper has examined the response of French gross job flows to real exchange rate fluctuations. To do so, it used a search based model of reallocation in an open economy, with embodied technology and heterogenous production

[41] Note also that the results for the import competing sectors indicate a higher reallocation during depreciations.

units. In the resulting model, both entry and exit play a major role in the dynamic adjustment process to exchange rate movements. Looking at cyclical disturbances, it concluded that it would concentrate most of the reallocation when the opportunity cost is lowest, that is, when the real exchange rate is most appreciated. A sudden change in the exchange rate, on the other hand, would trigger opposite movements in gross flows, as unproductive workers are immediately laid off and vacancies increase only slowly. These two polar cases highlight the importance of predictable movements in the driving process for intertemporal substitution and optimal timing.

Turning to French firm data on gross flows, I characterized the response of creation and destruction to fluctuations in the real exchange rate. The real exchange rate is industry-specific and constructed using export and import shares. The theoretical analysis predicts that (1) employment growth will decrease as the currency appreciates; (2) destruction will be more responsive than creation, and (3) both will be synchronized – positively or negatively. The results indicate that (1) real exchange rate movement have a substantial impact on net factor reallocation in traded sectors, in the direction predicted by theory. Traded sector employment growth decreases by 0.95% when the real exchange rate appreciates by 1%, thus eliminating an additional 35,000 jobs in that sector; (2) Unlike the model's prediction, job destruction is much less responsive to real exchange rate fluctuations than job creation; (3) Looking more finely at the dynamic adjustment pattern, job creation and destruction move in opposite directions in response to exchange rate innovations. This last finding is in accordance with theory if the real exchange exhibits a somewhat less predictable pattern. Overall, the pattern of gross job flows indicates that exchange rate movements matter, yet it implies little additional 'turbulence'. Future work should refine these conclusions by exploring in more details the implications in terms of wages, and relating the findings to sectoral characteristics of the export and import competing industries.

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