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Abstract: This paper evaluates the effects of introducing labor market flexibility into a small open economy characterized by tenure-increasing separation taxes. The model, which is calibrated to Argentinean observations, is subjected to different reforms: 1) the elimination of all separation costs, 2) the introduction of temporary contracts, and 3) the elimination of the separation costs from all new hires while freezing them on the workers that were hired prior to the reform. Contrary to the introduction of temporary contracts, which generate a sharp recessionary adjustment, the last type of partial reform is found to be an excellent second best alternative to a full reform.

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1. Introduction

For the last few decades a large number of countries have been imposing policies that penalize employers for firing workers (examples of this type of policies are severance payments, advance notice requirements, and procedural restrictions). In recent years, though, many of these countries have questioned the desirability of these policies and have introduced reforms intended to bring flexibility to their labor markets. Full reforms that get rid of all firing restrictions at once are rare. The reason is very simple: Workers that are protected under the existing firing restrictions have a strong preference to keep them, making the adoption of full labor market reforms a politically difficult task. As a consequence, labor market flexibility has typically been introduced through partial reforms and, in particular, through the introduction of temporary contracts. Temporary contracts allow for a trial period during which the employer can fire a worker at little or no cost. After the trial period is over, the worker becomes subject to regular firing restrictions. By leaving the protection of previously hired workers intact, this type of reform avoids the stiff opposition met by full reform. Spain, France, and Argentina are examples of countries that have introduced temporary contracts in recent years.

The effects of eliminating firing restrictions have been extensively analyzed in the literature (e.g. Alvarez and Veracierto [3], [4], Bentolila and Bertola [7], Hopenhayn and Rogerson [11], Millard and Mortensen [14]). More recently, a number of papers have studied the effects of temporary contracts as well (e.g. Aguirregabiria and Alonso-Borrego [1], Alonso-Borrego, Fernandez-Villaverde and Galdon-Sanchez, [2], Alvarez and Veracierto [5], Blanchard and Landier [8], Cabrales and Hopenhayn [9], Nagypal [17]). By considering a more realistic type of labor market reform these papers have made an important contribution to the literature. However, they have focused on the long-run effects, abstracting from the short-run consequences. Analyzing the short-run effects is important not only to obtain a more complete picture of labor market reforms, but also because they may lead to a different view

about their potential benefits. The purpose of this paper is to evaluate both the short-run and the long-run effects of temporary contracts (as well as other partial reforms) and compare them with the consequences of introducing full reforms. Special attention will be given to the effects on unemployment, since this has been a major concern in countries that implemented this type of policies.[1]

The model used is a small open economy version of Alvarez and Veracierto [5], which in turn is based on the search model of McCall [16] and in the equilibrium unemployment model of Lucas and Prescott [13]. Production in the economy is done on a large number of islands that use labor as the only input of production in a constant returns to scale technology. The islands are subject to idiosyncratic productivity shocks that follow a Markov process over time. At the beginning of each period, workers are distributed in some way across the islands. After the productivity shocks are realized, the workers must decide whether to leave the islands where they are currently located and become non-employed, or to stay on their islands and work. Agents that work start the following period on the same islands where they are currently located. Non-employed agents have two alternatives: to search for a new job or to leave the labor force. If an agent searches for a new job, he randomly arrives at one of the islands at the beginning of the following period. If an agent leaves the labor force he obtains leisure during the current period but continues to be non-employed during the following period. Households are constituted by a large number of members that perfectly share their employment risk. As a consequence, agents are allocated across islands to maximize the expected discounted value of their earnings. Labor markets are competitive: within each island, both firms and workers take the wage rate as given.

In this economy the government imposes separation taxes whenever an agent leaves an island. The separation taxes are rebated as a lump-sum transfer to the households. A novel

[1] In fact, temporary contracts have often been introduced with the purpose of reducing unemployment. Argentina's 1995 reform is a clear example.

feature of this paper is that the separation taxes are allowed to increase with the tenure of a worker, unlike the previous literature which assumed a constant separation tax. The assumption that separation taxes increase with tenure is not only a significant gain in realism but also will play a crucial role in some of the main results of this paper.

The model is parametrized to reproduce important observations for the Argentinean economy.[2] In particular, separation taxes are chosen to reproduce the tenure-dependent mandated severance payments that characterize that economy. In turn, the technology and preference parameters are chosen to reproduce the interest rate, the unemployment rate, the labor force participation and the elasticity of labor supply for Argentina. Under such parametrization, the model is simulated to evaluate how Argentina would react under different labor market reforms. Even though the model is calibrated to the Argentinean economy it is much broader in scope: it will shed important insights on the qualitative effects of different types of labor market reforms.

The main results of the paper are the following. First, the welfare gains of removing all separation taxes in Argentina are found to be small: only 0.22% in terms of consumption. The effects on employment and output are sizable, though: in the long-run, output increases by 3.24% while employment increases by 3.77%. Second, temporary contracts of 6 months duration, like those introduced by the 1995 Argentinean labor market reform, have negligible effects on employment, output and welfare. Third, temporary contracts of very long duration can lead to positive welfare gains and to the same long-run outcomes as a full reform but involve a sharp recessionary adjustment, with employment decreasing 9.5% and output decreasing 6.4% during the first period of the reform. Fourth, a partial labor market reform that eliminates the separation taxes on new hires and freezes them on workers that were hired prior to the reform, leads to the same welfare gains and long-run outcomes as

[2]The fact that Argentina was a small open economy at the time of its labor market reforms makes it an ideal case to analyze using the model in this paper.

a full reform without generating a sharp recession. In fact, employment and output start increasing right after the introduction of the reform. Thus, this paper finds that this type of partial labor market reform represents an excellent second best alternative to a full reform.

The paper is organized as follows. Section 2 describes the economy, Section 3 describes a competitive equilibrium, Section 4 calibrates the model, Section 5 presents the results and Section 6 concludes the paper. A detailed appendix describes the computational algorithm.

2. The environment

The economy is populated by a representative household constituted by a large number of members with names in the unit interval. The household's preferences are given by the following utility function:

$$\sum_{t=0}^{\infty}\beta^t\left[\ln c_t + B\left(\frac{h_t^{1-\phi}-1}{1-\phi}\right)\right], \tag{2.1}$$

where $0<\beta<1$ is the discount factor, c_t is consumption, h_t is leisure, $B>0$, and $\phi>0$. Every period each household member must allocate his full time endowment to working, to searching, or to being out-of-the-labor-force, but not to more than one activity at the same time. The total amount of household's leisure is then given by

$$h_t = 1 - u_t - n_t, \tag{2.2}$$

where u_t is the number of household members that are searching (i.e. are unemployed) and n_t is the number of household members that are working (i.e. are employed).

The consumption good is produced by a unit measure of islands. Each island has a linear production function given by

$$y_t = z_t g_t,$$

where y_t is output, g_t is the labor input, and z_t is an idiosyncratic productivity shock to

the island. The idiosyncratic productivity shock z_t follows a finite Markov process with transition matrix Q, where $Q(z, z')$ is the probability that $z_{t+1} = z'$ conditional on $z_t = z$. Realizations of z_t are assumed to be independent across islands. Hereafter, the invariant distribution generated by the transition matrix Q will be denoted by η.

At the beginning of every period, there is a given distribution of agents across islands. An island cannot employ more than the total number of agents present in the island at the beginning of the period. If an agent stays on the island where he is currently located, he produces the consumption good and starts the following period in the same location. Otherwise, the agent leaves the island and becomes non-employed.

A non-employed agent has two alternatives. First, he can leave the labor force in order to contribute to household leisure. However, the following period the agent will remain non-employed. The second alternative is to search for a new job. If the agent chooses this alternative, he obtains zero leisure during the current period, but is randomly assigned to one of the islands at the beginning of the following period. An important feature of the search technology is that agents have no control upon which island they will arrive to (in this sense, the search is "undirected"). In particular, I will assume that the agents that search are assigned uniformly across all the islands in the economy.

3. A competitive equilibrium

This section describes a competitive equilibrium in which the government imposes employment separation taxes.[3] Alvarez and Veracierto [6] show, for a similar environment, that the equilibrium allocation is exactly the same whether the firms pay the separation taxes or the

[3]While the most common form of separation costs are mandated severance payments, the literature has often chosen to model them as separation taxes. The reason is simple. Given that they represent a bilateral transfer, severance payments would have no effects if perfect recontracting were allowed for. However, different institutional restrictions are believed to preclude perfect recontracting from taking place. Modelling the mandated severance payments as separation taxes is a simple way of introducing this type of restrictions.

workers. The only difference is in terms of the equilibrium process for wages. Given this result and since it is much easier to describe, I will consider the case where workers pay the taxes directly.

The policy regime treats workers with different tenure levels differently.[4] A worker with tenure j must pay a tax $\tau(j)$ to the government if he decides to leave. When the agent arrives at a new island his tenure level is reset to zero, independently of the agent's tenure in the previous island. The total amount of separation taxes collected by the government is rebated as lump-sum transfers to the households. For simplicity, I will assume that there is some tenure level J such that $\tau(j) = \tau(J)$ for every $j > J$, i.e. the government treats all workers with tenure larger or equal to J the same way. In what follows, tenure levels will then be indexed between 0 and J.

Within each island there are competitive labor markets. As a consequence, the wage rate is simply given by the labor productivity z of the island. I will also assume that the economy is small and open, and that households can freely borrow and lend at the international interest rate $1 + r = 1/\beta$.[5] The fact that the interest rate and the wage rate at each type of island are independent of the aggregate state of the economy will considerably simplify the computation of an equilibrium.

The individual state of the household is given by the assets at the beginning of the period a and the beginning of the period distribution ψ of household members across tenure and productivity levels. Hereafter, $\psi(j, z)$ will denote the number of household members that have tenure j in an island with productivity z. The aggregate state of the economy is given by the aggregate assets A and the aggregate distribution Ψ of agents across tenure and productivity levels.

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[4] The tenure j of a worker in a particular island is the number of periods that the agent has been employed on that island since the time of his arrival.

[5] The assumption that the international interest rate is equal to the inverse of the discount factor is standard: It is made to guarantee stationarity.

The household problem is described by the following Bellman equation:

$$H(a,\psi,A,\Psi) = \max_{a',u,g}\left\{\ln c + B\left(\frac{(1-u-n)^{1-\phi}-1}{1-\phi}\right) + \beta H\left(a',\psi',A',\Psi'\right)\right\}$$

subject to

$$\begin{aligned}
c + a' &\leq \sum_z \sum_{j=0}^{J} z g(j,z) - \sum_z \sum_{j=0}^{J} \tau(j) \max\left(0, \psi(j,z) - g(j,z)\right) \\
&\quad + (1+r)\, a + T(A,\Psi) && (3.1)\\
g(j,z) &\leq \psi(j,z), \text{ for } j = 0,...,J && (3.2)\\
n &= \sum_z \sum_{j=0}^{J} g(j,z) && (3.3)\\
\psi'(0,z') &= \eta(z')\, u && (3.4)\\
\psi'(j,z') &= \sum_z g(j-1,z)\, Q(z,z'), \text{ for } j = 1,...,J-1 && (3.5)\\
\psi'(J,z') &= \sum_z \left[g(J-1,z) + g(J,z)\right] Q(z,z') && (3.6)\\
(A',\Psi') &= L(A,\Psi), && (3.7)
\end{aligned}$$

where $g(j,z)$ is the number of household members with tenure j that work on an island with productivity z, and T are the lump sum transfers from the government. Equation (3.1) is the budget constraint of the household, which states that consumption plus savings cannot exceed income. Income is given by the total amount of wage earnings net of separation taxes, the interest on previously accumulated assets and the lump sum transfers. Observe that whenever workers of tenure j leave the islands where they are currently located, i.e. whenever $g(j,z) < \psi(j,z)$, the household must pay a tax $\tau(j)$ per reduction in that type of workers. Equation (3.2) states that the number of household members that work under some given tenure and productivity level cannot exceed the number of household members of that type at the beginning of the period. Equation (3.3) gives the total number of household members that work. Equation (3.4) states that the number of household members that in

the following period have tenure equal to zero and is on an island with productivity z' is given by all household members that search during the current period and arrive at an island with productivity z'. Observe that the probability of arriving at an island of productivity z' is given by the corresponding probability under the invariant distribution η. Thus, equation (3.4) uses the fact that agents that search become uniformly distributed across all the islands in the economy. Equation (3.5) states that, for $j = 1, ..., J-1$, the number of household members that will have tenure j on an island with productivity z' in the following period, is given by the total number of household members that have current tenure equal to $j-1$ and work on an island that will transit to productivity z' in the following period. Similarly, equation (3.6) states that the number of household members that will have tenure J on an island with productivity z' at the beginning of the following period is given by all the household members that either have tenure $J-1$ or tenure J during the current period and work on an island that will transit to productivity z' in the following period. Equation (3.7) is the law of motion for the aggregate state of the economy, which is needed to forecast future lump-sum transfers.

Let $s(a, \psi, A, \Psi)$, $g(j, z; a, \psi, A, \Psi)$, and $u(a, \psi, A, \Psi)$ be the optimal savings, employment, and unemployment decision rules of the household, respectively. The equilibrium law of motion for the aggregate state of the economy $L(A, \Psi)$ must then satisfy that

$$\begin{aligned}
A' &= s(A, \Psi, A, \Psi) \\
\Psi'(0, z') &= \eta(z')\, u(A, \Psi, A, \Psi) \\
\Psi'(j, z') &= \sum_z g(j-1, z; A, \Psi, A, \Psi)\, Q(z, z'), \text{ for } j = 1, ..., J-1 \\
\Psi'(J, z') &= \sum_z \left[g(J-1, z; A, \Psi, A, \Psi) + g(J, z; A, \Psi, A, \Psi) \right] Q(z, z'),
\end{aligned}$$

that is, the aggregate law of motion must be generated by the optimal decisions of the representative household. Similarly, the equilibrium lump-sum transfers $T(A, \Psi)$ are given

by the separation taxes paid by the representative household:

$$T(A,\Psi)=\sum_{z}\sum_{j=0}^{J}\tau(j)\max\left(0,\Psi\left(j,z\right)-g\left(j,z;A,\Psi,A,\Psi\right)\right).$$

3.1. Characterization

In what follows I provide a characterization of a competitive equilibrium. To simplify the notation I will define the economy-wide employment and unemployment decision rules as follows

$$\begin{aligned} G\left(j,z;A,\Psi\right) &= g\left(j,z;A,\Psi,A,\Psi\right), \text{ for } j=0,..,J \\ U(A,\Psi) &= u(A,\Psi,A,\Psi). \end{aligned}$$

Let $v(j,z)$ be the value to the household of having a household member of tenure j on an island with productivity z and let θ be the value to the household of having a non-employed household member.[6] If the household is indeed optimizing, these values must satisfy the following functional equation:

$$v\left(j,z\right)=\max\left\{z+\beta\sum_{z'}v\left(\max\left\{j+1,J\right\},z'\right)Q(z,z'),\theta-\tau(j)\right\}, \text{ for } j=0,...,J. \quad (3.8)$$

Equation (3.8) states that a household member with tenure j on an island with productivity z is allocated to the best of two alternatives. The first alternative is to work on the island and earn a wage rate equal to z during the current period. The following period the agent's tenure on the island increases by one period (except when the tenure is already equal to J) while the island transits to a new productivity shock according to the transition function Q. The second alternative is to leave the island and obtain the value of non-employment θ after

[6] These values are expressed in consumption units.

payment of the separation tax $\tau(j)$.

The equilibrium employment decisions $G(j,z;A,\Psi)$ are straightforward. For $j=0,...,J$,

$$G(j,z;A,\Psi)=\left\{\begin{array}{c}\Psi\left(j,z\right),\text{ if }v(j,z)>\theta-\tau(j)\\ 0,\text{ otherwise}\end{array}\right\}. \tag{3.9}$$

That is, for each tenure and productivity level, everybody stay if the value of staying is larger than the value of leaving. Otherwise, everybody leave.

Aggregate employment is then given by:

$$N(A,\Psi)=\sum_{z}\sum_{j=0}^{J}G(j,z;A,\Psi), \tag{3.10}$$

and aggregate output is:

$$Y(A,\Psi)=\sum_{z}\sum_{j=0}^{J}zG(j,z;A,\Psi). \tag{3.11}$$

The household allocates non-employed members between unemployment and out-of-the-labor-force until the household is indifferent to both alternatives. As a consequence, the value of non-employment must be equal to the value of search:

$$\theta=\beta\sum_{z'}v\left(0,z'\right)\eta\left(z'\right). \tag{3.12}$$

The value of search is the present discounted value of randomly arriving at one of the islands with a tenure level equal to zero. Substituting this expression in equation (3.8) shows that there was no loss of generality in assuming that θ is a constant independent of the state of the economy. The above indifference condition also requires that

$$\theta=B\left(1-U(A,\Psi)-N(A,\Psi)\right)^{-\phi}C+\beta\theta. \tag{3.13}$$

This equation states that the value of being non-employed must be equal to the value of

being out-of-the-labor-force for one period, which is given by the marginal utility of leisure (expressed in consumption units), plus the present value of being non-employed during the following period. Observe that, while unemployment $U(A,\Psi)$ and aggregate employment $N(A,\Psi)$ depend on the aggregate state of the economy, consumption C is constant along the equilibrium path. The reason is that the international interest rate $1+r$ equals the inverse of the discount factor β. Since both θ and C are constant, equation (3.13) states that out-of-the-labor-force $1-U(A,\Psi)-N(A,\Psi)$ is also constant along an equilibrium path.

Finally, the equilibrium law of motion for the distribution Ψ is provided by:

$$\Psi'(0,z') = \eta(z')\,U(A,\Psi) \tag{3.14}$$

$$\Psi'(j,z') = \sum_{z} G(j-1,z;A,\Psi)\,Q(z,z'), \text{ for } j=1,...,J-1 \tag{3.15}$$

$$\Psi'(J,z') = \sum_{z} \left[G(J-1,z;A,\Psi)+G(J,z;A,\Psi)\right]Q(z,z'), \tag{3.16}$$

while the equilibrium law of motion for asset holdings satisfies

$$A' = Y(A,\Psi)+\frac{1}{\beta}A-C. \tag{3.17}$$

Observe from equations (3.9), (3.10), (3.11) and (3.13) that the employment rules $G(j,A,\Psi)$, aggregate employment $N(A,\Psi)$, aggregate output $Y(A,\Psi)$, and unemployment $U(A,\Psi)$ actually do not depend on the assets level A, only on the distribution Ψ. Solving equation (3.17) forward, we see that the initial amount of assets A_0 is an important determinant of the consumption level C, which affects the amount of labor force participation through equation (3.13). Labor force participation in turn determines the evolution of the distribution Ψ in equations (3.14), (3.15), and (3.16). Thus, while the path for assets can be obtained as a mere residual from equation (3.17), the initial amount of assets is a key determinant of the equilibrium variables.

4. Parametrization of the benchmark economy

This section describes the choice of parameter values for the benchmark economy. There are four parameters to be determined, β, ϕ, B, and A, the set of values for the idiosyncratic productivity shocks z, the transition matrix Q, and the separation taxes $\tau(j)$. Their values are selected so that the steady state corresponding to the assets level A reproduces important observations for the Argentinean economy.[7] The model time period is chosen to be half-a-quarter to allow for the possibility of short spells of unemployment and to obtain more detailed short-run dynamics, which is the focus of this paper.

Observe that, by assumption, the discount factor β is related to the model real interest rate according to $1 + r = \beta^{-1}$. Given that Argentina is a small open economy, it seems reasonable to select β to match the international interest rate. For this reason, a discount factor $\beta = 0.9951$ is chosen to generate an annual interest rate of 4%, which is approximately the interest rate for the United States.

The set of values for the idiosyncratic productivity shocks z and the transition matrix Q are restricted to approximate the following AR(1) process:

$$\ln z_{t+1} = \rho \ln z_t + \varepsilon_{t+1},$$

where $\varepsilon_{t+1} \sim N(0, \sigma^2)$, and $0 < \rho < 1$.[8] Both the persistence of the productivity shock ρ and the variance of its innovations σ^2 are key determinants of the decisions to search. As a consequence, they are selected to generate an unemployment rate of 15% and an average duration of unemployment equal to 4 months. This requires that $\rho = 0.95$ and $\sigma^2 = 0.0189$. An unemployment rate equal to 15% was the normal level for Argentina during the late

[7] A steady state is a competitive equilibrium such that $A_t = A$ and $\Psi_t = \Psi$, for $t = 0, 1, ..., \infty$. For the model economy described in this paper there exists a different steady state for each possible value of the assets level A.

[8] A total of 120 values for z will be allowed in the computations.

nineties, while an average duration of unemployment equal to 4 months is the magnitude reported by Galiani and Hopenhayn [10].

The weight B and the curvature ϕ of leisure in the utility function are important determinants of the labor force participation decisions. For this reason, a weight of leisure $B = 0.629$ is chosen to generate a labor force participation equal to 72%, the level for Argentina during the late nineties. In turn, a curvature parameter $\phi = 0.55$ is chosen to generate an elasticity of labor force participation with respect to wages equal to 0.7, which is consistent with evidence for the Argentinean economy (MTSS [15]).

The amount of assets A in turn is selected to reproduce Argentina's foreign net indebtedness. According to the IMF [12], the international liabilities of Argentina in 1998 amounted to $207 billion while their international assets totalled $140 billion. Since Argentina's GDP was $299 billion, this suggests choosing a negative value for A so that the model debt to annual output ratio equals 22%. A value of $A = -1.92$ turns out to be consistent with this observation.

Finally, the policy regime is selected to reproduce important features of the Argentinean system. Before the 1995 reform, which introduced temporary contracts, the Argentinean labor market regime had been surprisingly stable. It was characterized by a lack of unemployment insurance and by severance payments that increased with the worker's tenure. In particular, the severance payments required by the government amounted to one month of wages per year worked. To mimic this system, the tax schedule in the model economy is restricted to the following form:

$$\tau(j) = j\widehat{\tau}, \text{ for } j = 0, 1, ..., J.$$

Observe that workers with zero tenure are subject to no separation taxes and that each period of employment increases the separation taxes by $\widehat{\tau}$. The tax increment $\widehat{\tau}$ was selected so that the separation taxes after one year of employment $\tau(8)$ equal one month of model

wages.[9] This required that $\widehat{\tau} = 0.1468$. The upper bound J on tenure levels was set at 96, leading to an upper bound for the separation taxes equal to one year of wages. Given the relatively short average duration of employment, very few workers end up making the maximum payment.

5. Results

This section evaluates different ways of introducing labor market flexibility to the benchmark economy that was calibrated in the previous section. The labor market reforms analyzed are the following: 1) elimination of all separation costs, 2) introduction of temporary contracts, and 3) elimination of the separation costs from all new hires, while freezing them on the workers that were hired prior to the reform.

5.1. Elimination of all separation costs

Starting from the benchmark equilibrium with separation taxes (calibrated in the previous section), the government announces that there will be no more separation costs in the future. The reform applies not only to the new hires, but to the workers that had been hired prior to the reform. The separation taxes are then given by

$$\tau(j) = 0 \text{ for } j = 0, ..., J^*,$$

and the initial distribution Ψ_0 is given by

$$\Psi_0(j, z) = \Psi^*(j, z), \text{ for } j = 0, ..., J^*, \text{ and for all } z,$$

[9] Recall that one year is made of eight model periods.

where Ψ^* and J^* are the steady state distribution and the upper bound on tenure levels for the benchmark economy, respectively. Figure 1 shows the short-run effects of the reform while the second column of Table 1 shows the long-run effects.[10]

Figure 1.A shows, for $j = 0, ..., J^*$, the productivity thresholds $\bar{z}(j)$ that trigger employment separation.[11] Under laissez-faire, since $\tau(j) = 0$ for every j, the productivity thresholds are independent of j. On the contrary, in the benchmark economy the productivity thresholds decline with j because the separation taxes $\tau(j)$ are increasing in j. Observe that switching to a laissez-faire regime decreases the productivity thresholds at low j's and increases them at high j's. This is quite intuitive. In the economy with separation taxes workers are very picky about accepting a new employment opportunity, but lower their standards (once they are hired) as their separation taxes start to increase. The change in productivity thresholds across regimes has important implications for the behavior of the economy during the first period of the reform. Figure 1.B shows that the decrease in the productivity threshold corresponding to $j = 0$ makes the job-acceptance rate (defined as the fraction of the new arrivals that accept employment) increase during the first period of the reform and stay constant thereafter.[12] On the other hand, the job-separation rate (defined as the fraction of previously employed workers who leave their islands) declines during the first period of the reform. The reason is that the average duration of employment is quite short: only 15 periods. Since most of the workers have relatively small j's, the decrease in productivity thresholds at small j's (in Figure 1.A) becomes the dominant effect, reducing the aggregate job-separation rate on impact. With the larger job-acceptance rate and the

[10] The steady state values of all variables are normalized to 100 in the benchmark economy, except for the unemployment rate, which is measured in its original units. The welfare measure reported in Table 1 is the permanent proportionate increase in consumption that should be given to the representative household in the benchmark economy, to make it indifferent with switching to the corresponding reform.

[11] The productivity threshold $\bar{z}(j)$ is the largest z satisfying that $v(j, z) = \theta - \tau(j)$.

[12] The constant job acceptance rate is given by the sum of the probabilities $\eta(z)$ across all z's greater than $\bar{z}(0)$.

lower job-separation rate, Figure 1.C shows that there is a slight increase in aggregate employment during the first period of the reform. However, labor force participation increases quite substantially due to the permanent elimination of all separation taxes. Given that the new entrants have to search before they become employed, the economy experiences a big increase in unemployment during the first period of the reform. In fact the unemployment rate jumps from 15.0% to 17.1% during that initial period. The decrease in aggregate productivity during the first period of the reform shown in Figure 1.D is a consequence of the decrease in productivity thresholds at low j's. Despite the lower aggregate productivity, output increases because of the increase in employment. After the first period of the reform, there is a substantial increase in employment, as the larger number of unemployed agents (that came from the home sector) find jobs at the higher job-acceptance rate. Observe that the job-separation rate starts to increase after the first period of the reform because more islands transit to lower productivity levels that are closer to the new lower thresholds (at low j's) and are therefore more likely to cross them.[13] This is also the reason why aggregate productivity in Figure 1.D continues to decrease after the first period of the reform. However, output grows at a fast pace due to the strong increase in employment.

Table 1 shows that removing all firing taxes increases both the long-run job-acceptance rate and the job-separation rate. This was anticipated because of the lower costs of reallocating workers across islands. What is interesting, though, is that the increase is much larger for the job-acceptance rate, leading to a lower long-run unemployment rate despite its initial increase during the first period of the reform. The particular structure of the productivity shocks and separation taxes in the benchmark economy explains this result. Given that the productivity shocks are very persistent, when a worker accepts employment he expects to remain in the same island for a long time. As a consequence, he expects that the sepa-

[13] Observe that there is mean reversion in the productivity levels and that the mean value of z is approximately equal to 1 (much lower than the productivity thresholds at low j's).

ration costs will be high when he decides to leave later on. This makes the worker quite conservative about which islands to accept employment from, leading to a relatively low job-acceptance rate in the benchmark economy. On the other hand, given that the separation taxes increase slowly with the tenure level, the productivity thresholds decrease very slowly after the workers are hired. As a consequence, the probability of receiving a productivity realization below the thresholds remains high and the job-separation rate is relatively large in the benchmark economy. This explains why the job-separation rate increases much less than the job-acceptance rate when moving to the laissez-faire economy.

In terms of welfare levels, we see that the benefits of removing the separation taxes are rather small: only 0.22% in terms of consumption. This contrasts with the previous literature, which reported large welfare benefits of eliminating separation taxes (e.g. Hopenhayn and Rogerson [11], Veracierto [18]). The main reason for the different result is the way that the separation taxes have been introduced. While in this paper the separation taxes increase linearly with tenure levels, the previous literature introduced separation taxes that jump to a constant value right after the workers become hired. This leads to very different effects. When the separation taxes jump to a (large) constant value right after hiring, the workers that search become very reluctant to accept employment and the workers that have been employed (even those recently hired) become very reluctant to leave their jobs. Given their larger effects on the job acceptance and job separation rates, the constant separation taxes become more distortionary and produce larger welfare effects than the tenure-increasing separation taxes.[14]

[14]To test this intuition I performed the following experiment. Starting from the benchmark equilibrium reported in the first column of Table 1, I eliminated the tenure-increasing separation taxes and introduced a constant separation tax equal to the average separation taxes actually paid in the benchmark economy (which amount to two months of wages). I found that the constant separation tax reduced the job acceptance rate by 23% and the job separation rate by 45%, relative to the benchmark economy. In turn, it decreased welfare by 1.4%.

5.2. Temporary contracts of short duration

This section analyzes the effects of introducing a temporary contracts regime with the following characteristics. Whenever an agent enters an island for the first time he begins a trial period of fixed duration T, during which he can leave the island at no cost. After the trial period is over (i.e. $T+1$ periods after the arrival to the island), the agent becomes a permanent worker and is subject to the same schedule of separation taxes as in the benchmark economy. In particular, the separation taxes are now given by:

$$\begin{aligned} \tau(j) &= 0, \text{ for } j = 0, ..., T \\ \tau(j) &= \tau^*(j-T), \text{ for } j = T+1, ..., T+J^* \end{aligned}$$

and the initial distribution Ψ_0 is given by

$$\begin{aligned} \Psi_0(0,z) &= \Psi^*(0,z), \text{ for all } z, \\ \Psi_0(j,z) &= 0, \text{ for } j = 1, ..., T \text{ and all } z, \\ \Psi_0(j,z) &= \Psi^*(j-T,z), \text{ for } j = T+1, ..., T+J^* \text{ and all } z, \end{aligned}$$

where Ψ^*, J^* and τ^* are the steady state distribution, the upper bound on tenure levels and the separation taxes for the benchmark economy, respectively.[15] Observe that the workers that searched during the period prior to the reform are allowed to begin a new temporary contract during the first period of the reform, while the workers that were employed prior to the reform are treated as permanent workers subject to the same separation taxes that they would have faced before the reform. In particular, if a worker was employed with tenure $j-1$ during the period prior to the reform, he is considered to have tenure $j+T$ during the first period of the reform. This way of introducing temporary contracts resembles the 1995

[15] Note that the case $T=0$ reduces to the benchmark economy.

Argentinean labor market reform. The length of the trial period T is set to 4 to match the six months temporary contracts introduced by that reform. Figure 2 shows the short-run effects of the reform while the third column of Table 1 shows its long-run effects.

Figure 2.A shows, for $j = 0, ..., T + J^*$, the productivity thresholds $\bar{z}(j)$ that trigger employment separation. We see that the productivity threshold for the new arrivals (i.e. for $j = 0$) is low, but that it increases over the trial period. This is quite intuitive: as the worker gets closer to being subject to the separation taxes, the benefits of being employed at a given productivity level decreases relative to the value of search. Indeed, Figure 2.A shows that there is a sharp increase in the productivity threshold right before the worker becomes subject to the separation taxes. After the trial period is over, the productivity threshold decreases with the tenure level as the separation taxes increase.

To evaluate the initial effects of the reform, Figure 2.A also shows the productivity thresholds that each initial type of worker would had if the benchmark regime were continued for one more period. That is for $j = 0$, Figure 2.A shows the benchmark productivity threshold $\bar{z}^*(0)$, and for $j > T$ it shows $\bar{z}^*(j - T)$.[16] We see that the decrease in the productivity threshold for workers with $j = 0$ leads to a substantial increase in the job-acceptance rate in Figure 2.B. The reason this productivity threshold decreases is very simple: Accepting a new job becomes less costly because agents are not subject to separation taxes during their first T periods of employment. However, the productivity thresholds of the agents that have been employed during the period prior to the reform (i.e. agents with $j > T$) increase. The reason is that they now have the possibility of leaving their positions in order to restart a new trial period. In fact, we see in Figure 2.B that this leads to a spike in the job-separation rate during the first period of the reform. The increase in the job-separation rate is substantially larger than the increase in the job-acceptance rate, and aggregate employment starts decreasing during the first period of the reform (contrary to the laissez-faire reform).

[16] Observe that there are no workers with tenure j between 1 and T during the first period of the reform.

Labor force participation increases because the trial periods lower the separation taxes, but since the trial period is short the increase is relatively small (compared to the laissez-faire economy). Despite the small increase in labor force participation, unemployment increases substantially during the first period of the reform due to the large increase in the job-separation rate. In fact the unemployment rate increases by the same amount as it did in the laissez-faire economy: from 15.0% to 17.1%.

Since most of the workers that are employed in the first period of the reform have been employed in the period previous to the reform (their initial j is larger than T) and the productivity thresholds for this type of workers increase uniformly, we see in Figure 2.D that aggregate productivity starts increasing on impact. However, output decreases due to the decrease in employment.[17]

After the first period of the reform, the job-separation rate starts to decrease as more workers become employed in trial periods (which have relatively low productivity thresholds), but five periods after the reform it begins to increase as workers start to leave their employment positions before gaining permanent status. In the long-run, the increase in the job-separation rate is larger than in the job-acceptance rate and the unemployment rate increases from 15.0% to 15.7% (contrary to the laissez-faire economy).[18] Employment is roughly unchanged in the long-run because the larger unemployment rate is compensated by the higher labor force participation. However, long-run output increases by 0.9% due to the productivity gains. Observe that the there are no welfare gains of introducing an Argentinean type of temporary contracts reform: the consumption equivalent gain is equal to 0.01%.

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[17] These results suggest that the labor market reforms introduced by Argentina in 1995 probably aggravated the severity of the recession originated by the Mexican devaluation (commonly known as the "tequila effect").

[18] Observe that the temporary contracts generate substantially more job turnover than laissez-faire.

5.3. Temporary contracts of long duration

The Argentinean reform was quite timid in terms of the length of the temporary contracts that it introduced, leading to zero welfare gains. Other countries, like France and Spain, introduced temporary contracts of much longer durations. This is a considerable improvement since the longer the temporary contracts, the closer to laissez-faire the long-run outcomes will be. To illustrate this point this section considers temporary contracts with a very long duration: mainly, a duration of 10 years (i.e. $T = 80$). The fourth column of Table 1 indeed shows that the long-run effects of this type of temporary contracts are virtually the same as laissez-faire. The intuition for this result is quite simple: With long temporary contracts, it is very unlikely that a worker will finish the trial period before he leaves his job due to a low productivity shock. As a consequence, the long-run job-acceptance and job-separation decisions of most of the workers will be similar to those under laissez-faire. However, we will see that the short-run dynamics are extremely different.

Figure 3.A shows that the productivity threshold for $j = 0$ is significantly lower than the benchmark value $\bar{z}^*(0)$, leading to a substantial increase in the job-acceptance rate (for the above reasons, the new threshold $\bar{z}(0)$ is actually the same as under laissez-faire). However, the productivity thresholds of workers that were employed prior to the reform (i.e. those with $j > T$) increase substantially relative to their benchmark values. The reason is that the value of search increases quite significantly (since workers can now regain employment under a long trial period), while staying in a pre-reform employment leads to higher separation taxes over time. As a consequence, there is a huge spike in the job-separation rate during the first period of the reform (see Figure 3.B), which translates into an immediate contraction of 9.5% in aggregate employment (see Figure 3.C).[19] Labor force participation increases by the same amount as under laissez-faire because workers expect that they will hardly ever finish a trial period (thus avoiding the separation taxes). This large destruction of employment

[19]Note that Figure 3 has a different scale from the rest of the figures.

together with the substantial increase in labor force participation lead to a large increase in unemployment. In fact, the unemployment rate jumps from 15.0% to 25.4% during the first period of the reform. The initial increase in productivity due to the separation of workers from relatively bad islands is compensated by the large decrease in aggregate employment, leading to a 6.4% decrease in output during the first period of the reform..

Thus, we see that temporary contracts of long duration are able to reproduce laissez-faire outcomes in the long-run but require a sharp recessionary adjustment in the short-run. The welfare gains are smaller than under a full reform (because of the recessionary adjustment) but remain positive: 0.14% in terms of consumption. However, policy makers will typically be concerned about the negative short-term outcomes and will be reluctant to introduce this type of reform. To guarantee that a reform is implemented and that the welfare gains are closer to potential, it is important to design a reform that delivers positive outcomes both in the long-run and the short-run. The next section explores one possibility.

5.4. New flexible contracts with a freeze on previous separation taxes

This section introduces a labor market reform with the following characteristics. All the new hires that take place after the reform become free of separation taxes. On the other hand, the separation taxes of workers that were hired prior to the reform are frozen at their pre-reform levels. Once these workers leave their pre-reform employments and pay their corresponding separation taxes, they become free of any subsequent separation taxes in their new jobs.

The equations describing a competitive equilibrium for this regime are somewhat different than before. The value of a household member with tenure j in an island with productivity z must now satisfy the following functional equation:

$$v\left(j,z\right)=\max\left\{z+\beta\sum_{z'}v\left(j,z'\right)Q(z,z'),\theta-\tau(j)\right\},\text{ for }j=0,...,J. \tag{5.1}$$

This equation is similar to (3.8) except that the tenure level for tax purposes does not increase

over time (since the separation taxes are now frozen).

Equations (3.9), (3.10), (3.11), (3.12), (3.13) and (3.17) remain the same as before. The only additional modification is the law of motion for the distribution Ψ which now becomes

$$\Psi'(0,z') = \eta(z')\,U(A,\Psi) + \sum_{z} G(0,z;A,\Psi)\,Q(z,z') \tag{5.2}$$

$$\Psi'(j,z') = \sum_{z} G(j,z;A,\Psi)\,Q(z,z'),\ \text{for } j=1,...,J. \tag{5.3}$$

Observe that when workers with tenure $j>0$ leave their islands, they never regain a positive tenure again: $j=0$ becomes an absorbing state.

Since we are interested in introducing this type of reform to the benchmark economy, the separation taxes are given by

$$\tau(j) = \tau^*(j) \text{ for } j=0,...,J^*,$$

and the initial distribution Ψ_0 is given by

$$\Psi_0(j,z) = \Psi^*(j,z),\ \text{for } j=0,...,J^*,\ \text{and for all } z,$$

where Ψ^*, J^* and τ^* are the steady state distribution, the upper bound on tenure levels and the separation taxes for the benchmark economy, respectively. Observe that $\tau^*(0)=0$, so the new hires in the post-reform regime are permanently waived from paying any separation taxes. Figure 4 shows the short-run effects of the reform while the last column of Table 1 shows the long-run effects.

Since the reform eventually leads to a laissez-faire equilibrium, the long-run effects of this reform are virtually the same as moving to laissez-faire at once.[20] Recall that introduc-

[20]The reason why the long-run effects are not the exactly same in both reforms is that they lead to different short-run dynamics and, consequently, to different long-run assets.

ing temporary contracts of long duration also led to laissez-faire outcomes in the long-run, but involved a sharp labor market adjustment in the short-run. The key question will be whether the partial reform considered in this section leads to a similar recessionary short-run adjustment or not. Figure 4 provides the answer.

Figure 4.A depicts the productivity thresholds for the benchmark economy and for the new regime, for $j = 0, ..., J^*$. It shows that the productivity threshold $\bar{z}(0)$ is much lower in the new regime than in the benchmark economy. The reason for this is that the new hires will never be subject to separation taxes. In fact the productivity threshold $\bar{z}(0)$ that corresponds to the new regime is exactly the same as under laissez-faire, leading to the same (higher) job-acceptance rate (see Figure 4.B). While this result is similar to that obtained under long temporary contracts there is a very important difference: The productivity thresholds of workers that have been employed prior to the reform (i.e. those with $j > 0$) are much lower in the new regime than in the benchmark economy (except for very high j's). At first sight this may seem a surprising result: The value of search increases quite substantially due to the fact that the new hires will never be subject to separation taxes again and this should increase the productivity thresholds. However, since the separation taxes are now frozen, the workers have no reason to leave their jobs as quickly as they did in the benchmark economy. This last effect happens to dominate and the productivity thresholds of workers with $j > 0$ decrease quite significantly.

The decrease in threshold levels for $j > 0$ leads to a reduction in the job-separation rate in the first period of the reform. With the lower job-separation rate and the higher job-acceptance rate, aggregate employment increases during that first period. The decrease in productivity thresholds (except for very high j's) lowers aggregate productivity. However, output increases due to the significant increase in employment. Labor force participation increases by the same amount as under laissez-faire because of the removal of the separation taxes from all the new hires. This increase is so large that it compensates for the lower job

destruction rate, and increases unemployment. In fact, the unemployment rate jumps from 15.0% to 16.2% during the first period of the reform, a somewhat lower increase than in the laissez-faire reform.

Thus, contrary to the temporary contracts of long duration, this partial reform generates similar outcomes as the laissez-faire reform, both in the long-run and the short-run, and leads to the same welfare gains. By avoiding the tough short-run adjustment required by the long temporary contracts, this type of partial reform represents a very useful second-best alternative.

6. Conclusions

This paper has analyzed the effects of introducing labor market flexibility into a small open economy subject to tenure-increasing separation taxes. Different reforms were considered: 1) the elimination of all separation costs, 2) the introduction of temporary contracts, and 3) the elimination of the separation costs from all new hires while freezing them on the workers that were hired prior to the reform. Calibrating the model economy to Argentinean data, the following results were obtained. First, the potential welfare gains of removing all separation taxes in Argentina are small: only 0.22% in terms of consumption. However, the effects on output and employment are sizable: in the long-run they increase by 3.24% and 3.77%, respectively. Second, temporary contracts of 6 months duration, like those introduced by the 1995 Argentinean labor market reform, have negligible effects on employment, output and welfare. Third, introducing temporary contracts of very long duration can lead to positive welfare gains and to the same long-run outcomes as a full reform but involve a sharp short-run recession. Fourth, a partial labor market reform that removes separation taxes on the new hires and freezes them on workers that were hired prior to the reform leads to the same welfare gains and long-run outcomes as a full reform without generating a recessionary adjustment. Thus, the paper finds that this type of partial labor market reform constitutes

an excellent second-best alternative to a full reform.

The main reason why temporary contracts of long duration generate a sharp recession, while the flexible new contracts (with a freeze on separation taxes) do not, is that they affect job-separation decisions in very different ways. When long temporary contracts are introduced, the value of search increases because the workers can start long trial periods with zero separation taxes. Given that the temporary contracts regime continues to penalize permanent workers for staying in their jobs (their separation taxes continue to increase with tenure), the higher value of search leads many permanent workers to leave their pre-reform jobs right after the reform is implemented.

The flexible new contracts with a freeze on separation taxes also increases the value of search (this time because the new jobs will never be subject to separation taxes). This tends to increase the job-separation rate. However, the freeze on separation taxes removes the same-job penalty, inducing workers to stay in their jobs much longer. This effect is so large that it dominates the higher value of search and leads to a lower job-separation rate when the reform is implemented.

While this paper provided important insight about the short-run effects of labor market reforms, there are two caveats to the analysis. The first one is the assumption of perfect risk sharing between a large number of household members. While it is quite plausible that the extended family in Argentina provides a more important safety network than in many other countries, the full risk-sharing assumption is rather extreme. However, the introduction of borrowing constraints should not change the results quite substantially. The reason is that the average duration of unemployment is very low in Argentina: only 4 months, as reported by Galiani and Hopenhayn [10]. Thus, similarly to other models calibrated to U.S. data, the workers would end up self-insuring quite well using their own savings.

Another caveat to the analysis is the assumption that labor is the only factor of production. Veracierto [18] shows that, in a closed economy, the presence of capital can substantially

affect the short-run dynamics after a labor-market reform is introduced. However, it is unlikely that a similar result would be obtained for a small open economy. An important reason why the presence of capital affects labor supply decisions in a closed economy is that higher investment requires lower consumption. It is to mitigate the consumption adjustment associated with the higher investment that agents decide to increase their labor supply along the transitionary path. In a small open economy this channel is absent: Due to international borrowing and lending, changes in the stock of capital do not require consumption adjustments. In fact, consumption always jumps to its new steady state level after a labor market reform. Given the absence of this important channel, given that determining empirically relevant capital adjustment costs for Argentina in the mid 90's would be a difficult task, and given the computational complexity that it would entail, I leave the introduction of capital to future research.

A. Appendix

This appendix describes the computational algorithm. Substituting equation (3.12) in equations (3.8), the values $v(j,z)$ can be obtained using standard recursive methods. The value of non-employment θ is then obtained from (3.12). These values are sufficient to determine the employment decision rules $G(j,z;\Psi)$ in equation (3.9).

Now, guess a value for out-of-the-labor-force H (which is known to be constant along the

equilibrium path). Starting from the initial distribution Ψ_0 at date 0, compute

$$\begin{aligned}
N_t &= \sum_z \sum_{j=0}^{J} G(j,z;\Psi_t) \\
Y_t &= \sum_z \sum_{j=0}^{J} zG(j,z;\Psi_t) \\
U_t &= 1 - N_t - H \\
\Psi_{t+1}(0,z') &= \eta(z')\, U_t \\
\Psi_{t+1}(j,z') &= \sum_z G(j-1,z;\Psi_t)\, Q(z,z'), \text{ for } j = 1,...,J-1 \\
\Psi_{t+1}(J,z') &= \sum_z \left[G(J-1,z;\Psi_t) + G(J,z;\Psi_t)\right] Q(z,z'),
\end{aligned}$$

for $t = 0, 1, ..., T$, where T is a large number such that all variables have approximately converged. Given the initial asset level A_0, compute the consumption level $\widehat{C}$ that is obtained from forward solving the household's budget constraint:

$$\frac{\widehat{C}}{1-\beta} = \sum_{t=0}^{T} \beta^t Y_t + \beta^{T+1} \frac{Y_T}{1-\beta} + \frac{A_0}{\beta}.$$

Calculate the consumption level $\widetilde{C}$ that is obtained from equation (3.13), i.e. which satisfies

$$\theta = BH^{-\phi}\widetilde{C} + \beta\theta.$$

Compare $\widehat{C}$ with $\widetilde{C}$. If $\widehat{C} \neq \widetilde{C}$, guess a new value for out-of-the-labor force H and start again. Continue until a root H^* to the function $\widehat{C}(H) - \widetilde{C}(H)$ is obtained. This can be implemented using standard root finding methods.

Table 1

Steady State Effects

	Benchmark economy	Laissez-faire	Temp. contr. ($T = 4$)	Temp. contr. ($T = 80$)	New flex contracts
Job acceptance rate	100.00	105.98	108.57	105.98	105.98
Job separation rate	100.00	101.78	114.48	102.52	101.78
Unemployment rate	15.00	14.48	15.68	14.57	14.48
Employment	100.00	103.77	100.08	103.67	103.77
Unemployment	100.00	99.65	105.52	100.28	99.65
Labor Force	100.00	103.15	100.90	103.16	103.15
Output	100.00	103.24	100.86	103.24	103.24
Consumption	100.00	103.23	100.82	103.16	103.22
Productivity	100.00	99.49	100.78	99.58	99.49
Debt	100.00	103.83	104.50	111.59	104.27
Welfare Gain	0.00	0.22	0.01	0.14	0.21

FIGURE 1: Laissez-faire

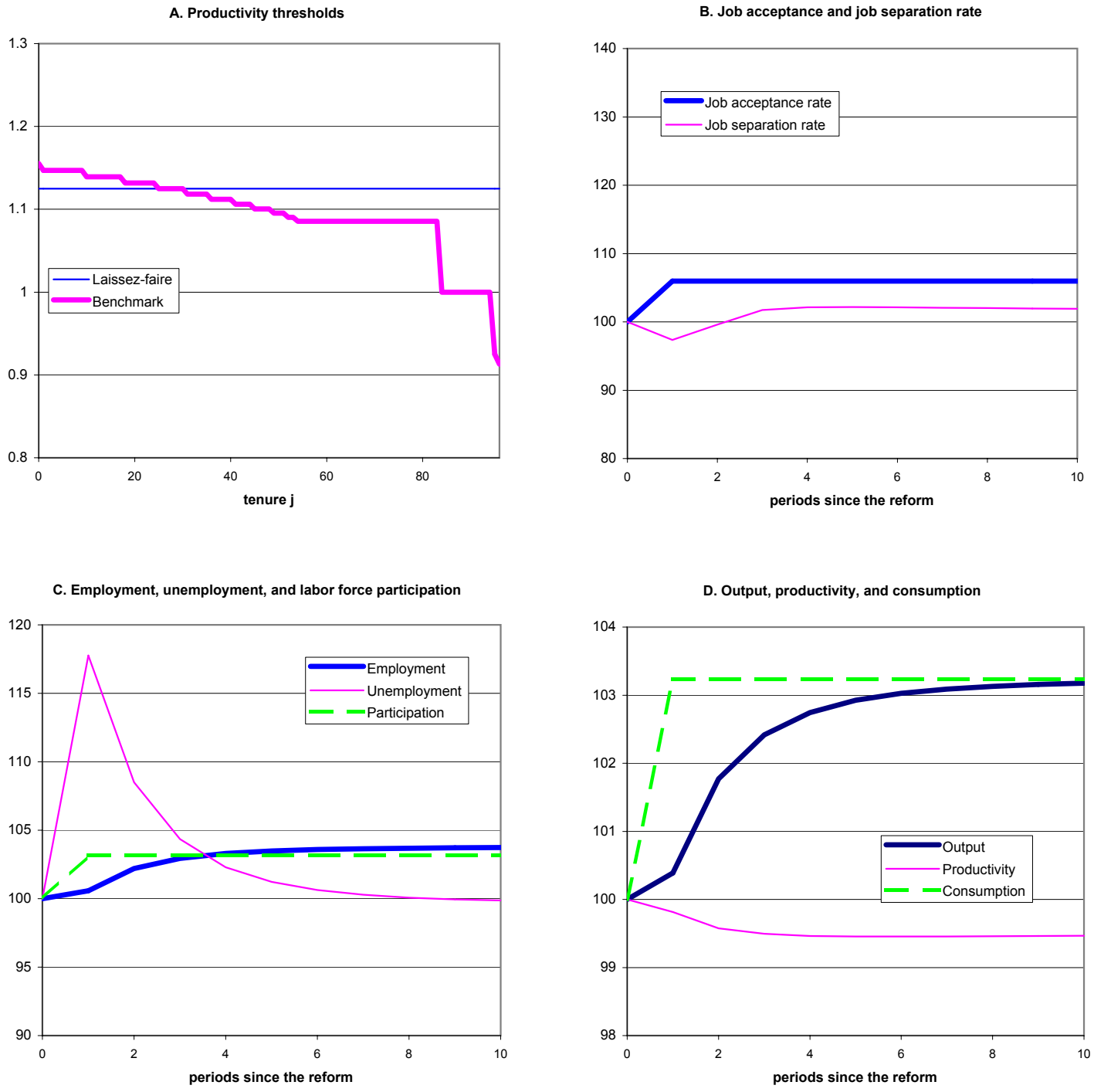


FIGURE 2: Temporary contracts of 6 months duration (T = 4)

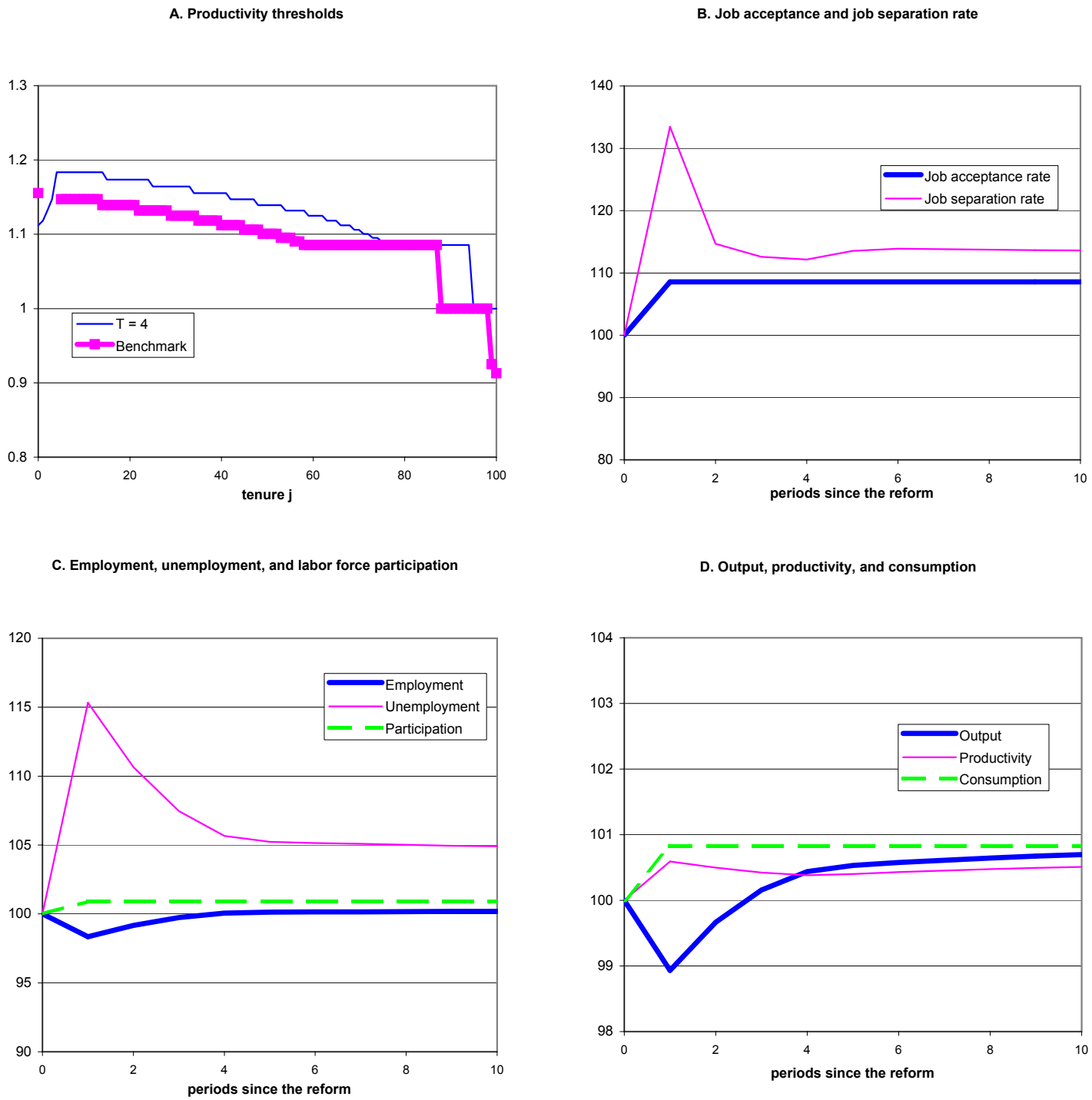


FIGURE 3: Temporary contracts of 10 years duration (T = 80)

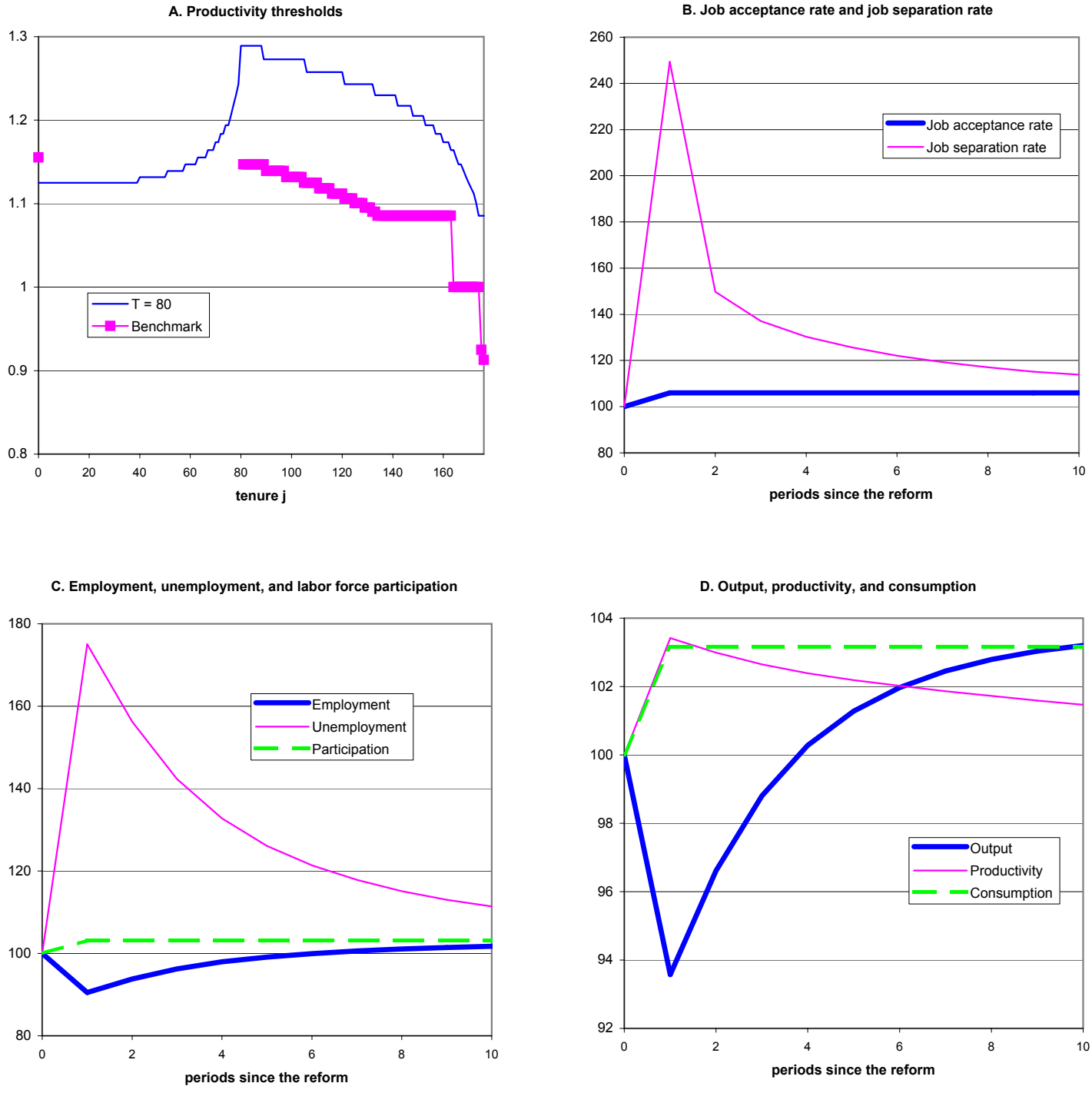
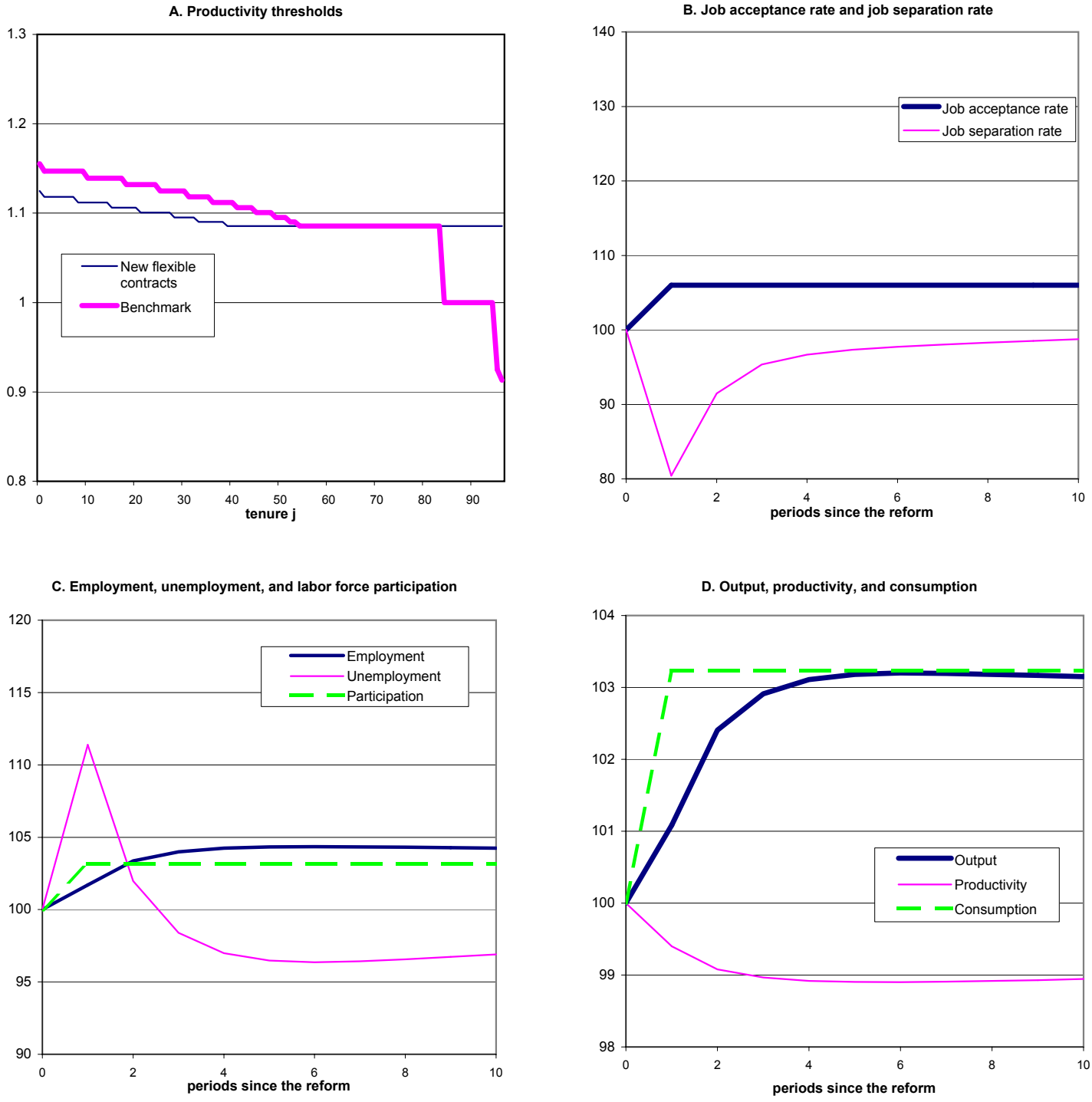


FIGURE 4: New flexible contracts with a freeze on separation taxes



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