Partisanship, Sectoral Allocation of Foreign Direct Investment, and Imperfect Capital Mobility*

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Abstract

We extend our earlier work on the political economy of foreign direct investment (Pinto & Pinto 2007, 2008) by modeling in a dynamic setting the interaction between an incumbent with partisan motivations, and a foreign investor who aims at obtaining the most favorable investment conditions while minimizing the probability of opportunistic behavior by the host government. This setting leads to a well-known problem in the literature on capital taxation: the incentive to tax capital more heavily once investment decisions have been made, given that the elasticity becomes zero. The extant literature points to institutional constraints as the solution to this commitment problem: ex-ante promises are more likely to be honored when the hands of the incumbent are tied (North & Thomas 1973; North & Weingast 1989; Henisz 2000). Yet the literature on capital taxation it is widely acknowledged that capital tax rates are in general not set at confiscatory levels even in the absence of institutional constraints. To account for this empirical regularity we develop a dynamic model where the host government only has access to partial commitment technologies. From this model we derive the conditions under which the host incumbent’s allegiance to domestic owners of labor or capital, and the expected distributive pressure exerted by inflows and outflows of internationally mobile capital on labor and capital could either aggravate or mitigate the commitment problem. The implications of this model are in line with the predictions from our earlier work on the existence of partisan cycles in the regulation of direct investment.

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1 Introduction

This paper extends our earlier work on partisan cycles in the regulation of foreign direct investment, and in investment performance. We argue that the incumbent’s partisanship -i.e.: its allegiance to labor or capital- affect foreign investors’ decision to enter a host country, investors’ choice of form of entry, and the consequences of the endogenously determined investment flows (Pinto 2004; Pinto & Pinto 2007; Pinto & Pinto 2008). Pro-labor governments encourage investment inflows that complement labor in production; right-leaning governments would internalize the interests of domestic businesses encouraging investment inflows that are more likely to complement domestic capital in production, generating positive spillovers effects on domestic businesses, and/or introduce labor saving technologies. Moreover, we theorized that domestic business interests would strictly prefer technology transfer agreements to investment capital inflows. We found a systematic relationship between the host government’s ideology -its placement in the left-right dimension-and the pattern of direct investment performance across countries and over time.¹ We also found a differential pattern of sectoral allocation of FDI under left and right-leaning governments and a divergent effect inflows on wages under different orientations of the incumbent, which are consistent with and supportive of the predictions from our model.

In this paper we model the interaction between the incumbent and foreign investors in a dynamic setting. Adding this dynamic element leads to a well-known problem in the literature on capital taxation: governments have an incentive to tax capital more heavily once investment decisions have been made, given that their elasticity to taxes becomes zero. In other words, as bargains become obsolete it is ex-post optimal to choose the highest possible tax rates on capital, even for governments that promise to maintain tax rates at their ex-ante optimal levels (Kindleberger 1969; Vernon 1971). Investors who face an exit cost will anticipate the government’s behavior, and will likely decide not to enter, resulting in missed investment opportunities and suboptimal policy. The extant literature has pointed to institutional constraints as the solution to this commitment problem: when the hands of incumbent are tied or when the incumbent’s ability to move the status quo is subject to delays by institutions constraints, promises made ex-ante are more likely to be honored (North & Thomas 1973; North & Weingast 1989; Henisz 2000). Yet, tying government’s hands is equivalent to adopting an inflexible policy; and inflexible policy is a departure from the first-best/optimal practices,

¹Yet our findings are far from conclusive since we could not identify the degree of complementarity or substitutability between labor and foreign capital in the different sectors. We were not able to test these hypotheses directly, since we could not assess whether foreign and domestic capital were complements or substitutes in production due to lack of reliable data for the countries and sectors in the sample. See Pinto & Pinto (2008) for a discussion on the constraints we faced in designing a direct test of our model.
i.e., the policies that would have been chosen in a complete contract environment, or adopted by a welfare maximizing social planner (Spiller & Tommasi 2003).

Moreover, it is widely recognized that capital tax rates are in general not set at confiscatory levels, even in the absence of institutional constraints. In order to account for this empirical regularity in section 3, we develop a dynamic model where the host government only has access to partial commitment technologies. From this model derive the conditions under which the host government’s partisanship -i.e, its allegiance to domestic owners of labor or capital- will result in qualitatively different tax schedules offered to foreign investors and the incentives faced by the incumbent to opportunistically tax foreign investors. These incentives faced by the incumbent depend on the distributive consequences created by foreign investment, which we model as a function of the technological relationship that determines the degree of complementarity and substitutability in production between foreign capital and domestic factors of production, and the costs of redeployment of that investment.\footnote{The technological relationship determines whether inflows of foreign capital in one sector have a positive effect on wages or the return to capital in each sector. Formally, assuming a production function \( q_i = f_i(K_i, k_i, L_i) \) in sector \( i \), this relationship affects whether \( \partial w_i/\partial k_i \geq 0 \) or \( \partial r_i/\partial k_i \geq 0 \). The costs of redeployment are modeled as a convex capital adjustment function. For a more detailed definition of these concepts see section 3.1.} The expected distributive pressure exerted by inflows and outflows of internationally mobile capital on the incumbent’s core constituents are likely to mitigate or aggravate the commitment problem. The implications of this model are in line with the predictions from our earlier model: we should expect partisan cycles in the regulation of internationally mobile capital. Moreover, the differential role of partisanship in the regulation of direct investment is lessened as exit costs increase.

2 Partisanship and Investment in a Dynamic Setting

In Pinto & Pinto (2008), we developed a model that predicts that governments have an incentive to discriminate in favor of internationally mobile investment that complements the factor of production owned by their core constituents. Investment in general, and direct foreign investment in particular, are likely to generate returns throughout many periods, even beyond multiple elections and incumbents. Hence, it would be reasonable to assume that when making investment decisions investors consider not only the current government partisanship, but also the potential orientation of future governments.

The design of the tax system in the economy is also driven by efficiency considerations which dictate that tax rates should be set at levels that minimize the distortions generated by the tax structure. Hence,
more inelastic tax bases should be taxed more heavily. In the case of capital taxation, as in foreign direct investment, there is an incentive to tax capital more heavily once investment decisions have been made, given that the elasticity becomes zero. In other words, it is optimal ex-post to choose the highest possible capital tax rates, even when governments promise to maintain tax rates at their ex-ante optimal levels. Investors will anticipate this behavior, and decide not to enter into the host country resulting in missed investment opportunities and suboptimal policy.

This problem is rooted in the time-inconsistency property of sequential policy. Government are unable to commit credibly to policies that will have an effect in the future. In the case of capital taxation, given that tax rates can be changed at any time, governments have an incentive to act opportunistically. However, we observe that in general tax rates on capital are not set at confiscatory levels, as would be predicted by these propositions. In order to account for the exceptionality of confiscatory tax rates, the literature in macroeconomics has formulated different explanations, including the existence of partial commitment technologies, institutional constraints and repeated interactions.

Klein and Rios Rull (1999), for example, consider a dynamic setup where governments can only commit to tax rates one period in advance due to exogenous restrictions which prevent governments from immediately revising the status quo. Owners of internationally mobile capital understand these constraints and make their investment decisions accordingly. Political institutions act as one such commitment devices that delay the policy changes. The institutional environment, namely the rules of the political game, acts as a solution to this commitment problem.

Chari and Kehoe (1990), on the other hand, claim that reputation may substitute for other forms of commitment mechanisms: ex-ante optimal tax rates can be sustained in equilibrium when there is a repeated interaction between governments and capital owners. This idea of commitment by reputation can be linked to the predictions on the role of partisanship in our earlier model. Suppose that foreign capital owners form expectations as follows. Initially foreign investors assume that partisan governments will tax capital at the ex-ante optimal tax rates \( \{t_1^{\ast}, t_2^{\ast}\} \), i.e., the tax rates that solve the maximization problem Pinto & Pinto (2008). As soon as capital owners realize that governments have deviated by choosing \( \hat{t}_i \neq t_i^{\ast} \) (for \( i = 1, 2 \)), they expect that governments will implement confiscatory tax rates \( \hat{t}_i \) in the future. Hence, expectations significantly change once governments deviate from \( t_i^{\ast} \). Let \( \Omega(t_1, t_2) \) denote the government’s

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3On time consistency see the pioneering work of Kydland and Prescott (1977), and Calvo (1978); see also Drazen (2000).
weighted welfare function evaluated at \( \{t^1, t^2\} \). Then the solution to this problem requires tax rates that satisfy \( \Omega(\hat{t}^1, \hat{t}^2) > \Omega(t^{1*}, t^{2*}) > \Omega(\hat{t}^1, \hat{t}^2) \). Under these conditions, governments may only benefit in the short-run from an opportunistic behavior by choosing \( \tilde{t}^i \). Given that confiscatory tax rates \( \hat{t}^i \) are expected by capital owners thereafter and capital will consequently not enter in the future, partisan governments will face a lower stream of future payoffs relative to those that can be obtained by sticking to the ex-ante optimal policy. Suppose that \( \rho \) is the partisan government’s discount factor. Then \( \{t^{1*}, t^{2*}\} \) can be sustained as an equilibrium of the repeated game if \( \rho \) is sufficiently large.

The predictions from Pinto & Pinto (2008) would also hold in a dynamic framework if we assume that foreign investment adjusts perfectly to the new desired level once governments change capital tax rates, or, alternatively, if foreign capital completely depreciates before tax rates are changed. Specifically, suppose that there is no foreign capital in the economy. At the beginning of time period the government would face the same problem as the one faced in time period \( \tau \). In every period, the equilibrium tax rates would be those derived from our earlier model. However, investors’ reaction to changes in the host government’s behavior may take some time.\(^5\) Whether the reaction is immediate or not depends on capital adjustment costs. In the following sections we consider how the dynamic solution varies at different levels of adjustment costs.

The model presented in the ensuing sections allows us to derive several propositions on the role of partisanship, technology and adjustment costs in the political economy of foreign direct investment performance and the regulation of FDI. First, higher costs of redeployment affect the incentives to tax foreign investment more heavily, irrespective of investment’s technological relationship with domestic factors of production. Second, we show that holding the costs of adjustment constant governments have an incentive to tax more heavily foreign capital that is substitute in production to the incumbents’ core constituents. The model also allows us to identify the conditions under which the incumbent will offer lower taxes in the second period to foreign investment that complements in production the factor owned by the governments’ constituents. The size of the tax breaks offered depends on the opportunity costs faced by investors -i.e.: the returns they could get abroad- and the relative weight placed by domestic actors on government transfers financed with the revenue obtained from taxing capital -i.e.: the tradeoff between direct income effects and indirect income effects through government transfers, which was also central to the predictions in Pinto & Pinto (2008). Third, as the probability that the incumbent will be replaced in the the second period increases, the rate of

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\(^5\) As discussed in the previous section several papers analyze the determination of capital tax rates in dynamic settings under different degrees of capital mobility. See Wildasin (2003), among others. These models consider that capital stocks can react to changes in capital taxation.
return offered to foreign investors to invest in the host in the first stage should be higher than opportunity
cost of investing abroad plus the cost of redeployment. Moreover, the rate of return should high enough to
sustain profitability during the tenure of the incumbent that is inclined to give favorable conditions to that
type of investor because it increases the demand and/or return of the factor of production owned by the in-
cumbent’s core constituent. In the second period the pro-investor government that succeeds a relatively more
anti-investor incumbent will offer an even lower tax rate than it would have offered in the first period. This
predictions are consistent with our findings on the differential sectoral allocation of FDI in OECD countries
as the orientation of the incumbent changed, and the positive effect of FDI on wages under the left (see Pinto
& Pinto 2008).

3 The Model

In this section, we describe the dynamic model employed in the present analysis. The model is basically an
extension of the one in Pinto & Pinto (2008).

3.1 Production

Consider a dynamic three-factor, two-sector, small-open economy. Decisions are made at two consecutive
time periods. Throughout the analysis, unprimed variables are current values and primed variables refer to
future values. Production of good \( i \) requires labor, domestic capital, and foreign capital. Production in sector
\( i \) is given by \( q_i = f_i(K_i, k_i, L_i) \), where \( K_i \) denotes domestic capital, \( k_i \) foreign capital, and \( L_i \) labor in sector
\( i = 1, 2 \). The production function \( f_i \) exhibits constant returns to scale. We assume perfect competition in the
input market, so factors of production are paid their respective marginal productivity. Domestic capital is
sector specific and constant over time. The amount of domestic capital in each sector is normalized to one.\(^6\)
Total domestic labor is assumed fixed in supply in both periods, i.e., \( \bar{L} = L_1 + L_2 = L_1' + L_2' \), mobile across
sectors within the country, but internationally immobile. Free mobility of labor across sectors assures that
the wages are equalized across sectors for every time period, i.e., \( w = w_1 = w_2 \) and \( w' = w_1' = w_2' \).

Foreign capital is available in perfectly elastic supply and can be rented at an exogenous rate \( r \) in

\(^6\)For notational simplicity, we exclude \( K_i \) as an argument of the production function.
every period. However, foreign investors’ reaction to changes in the host government’s behavior may take some time. Whether the reaction is immediate or not depends on a capital adjustment-cost function. With perfect capital mobility, the adjustment of foreign capital stock is immediate. When it is costly to change the stock of capital, only partial adjustment would take place. In other words, these costs would affect the speed at which foreign capital stocks levels reach the new desired levels. Specifically, consider the following adjustment cost function faced by foreign capital owners:

\[ C(k_i, k'_i) \equiv \frac{\phi_i}{2} \left( \frac{k'_i - k_i}{k_i} \right)^2 k_i. \]  

Note that \( C_i(k_i, k'_i) = 0, C_{k'i,i} > 0, \) and \( C_{k'k',i} > 0. \) A convex adjustment cost function implies that the capital stock does not jump immediately to its new level when the tax rate on capital is changed (see, for example, Barro and Sala-i-Martin (1995)). When \( \phi_i \) tends to infinity, it means that foreign capital stocks become fixed. The extreme case of immediate adjustment results when \( \phi_i = 0. \) Under these conditions, foreign capital adjusts perfectly to the new desired level and partisan governments face every time period \( t \) the same exact problem as in our earlier paper.

### 3.2 Economic agents

We assume that there are only two types of factor owners: workers (who only own labor), denoted with a \( L \), and domestic capitalists (who only own domestic capital), denoted with a \( K \). Thus, \( \bar{L} \) is the number of workers and \( \bar{K} \) the number of capitalists in the economy. Since the amount of domestic capital in each sector is normalized to one, \( \bar{K} = 2. \) Each period, consumers derive utility from income and from an in-kind transfer they receive from the government. Specifically, the utility of individual \( h \) in the current period is \( U^h = y^h + v(g^h) \), for \( h = L, K \), where \( y^h \) is the income of a representative agent in group \( h \), \( g^h \) is the transfer that each member of group \( h \) receives from the government, and \( v_g > 0, v_g(0) \rightarrow \infty, v_{gg} < 0. \) Income of labor is given by the wage \( w \), and income of domestic capitalists is denoted \( \bar{r}_i. \) A similar specification holds in the

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7Our stylized model intends to capture the following conditions. First, different types of foreign capital are available in infinite supply and ready to enter the country as either a complement or substitute of labor (or domestic capital). The amount of domestic capital is, on the other hand, limited. Second, we emphasize the idea that, within the country, the cost of moving across sectors is higher for domestic capital than for labor. The assumptions we make here are somewhat extreme. The predictions from our model would be substantively similar if domestic capital is assumed mobile while labor is sector specific. A variant of the model would make both labor and domestic capital sectorally mobile. In this case, however, governments will not be able to implement sector-specific policies. Essentially, for the conclusions of our model to hold we require one of the domestic factors to be relatively more specific than the other.

8Several analyze the determination of capital tax rates in dynamic settings under different degrees of capital mobility (see, for example, Wildasin 2003). These models consider that capital stocks can react to changes in capital taxation.

9Equivalently, we can also think that \( f_i(1, k_i, L_i) \) represents production in its intensive form.
next period.

### 3.3 Partisan government

The government collects each period a tax on internationally mobile capital and the receipts are distributed across the population through government in-kind transfers, as explained above.\textsuperscript{10} We assume that the government can impose different tax rates on foreign capital allocated in different sectors in each period.\textsuperscript{11} We denote with $\tau_i$ the capital tax rate on foreign capital entering sector $i$, or $i = 1, 2$ in the current period, and with $\tau'_i$ the corresponding tax in the next period.

Governments are characterized by different political orientation (pro-domestic labor or pro-domestic capital). A government decides the optimal values of $\{\tau_1, \tau_2, g^L, g^K\}$ for the period it will be in power; the choice driven by the incumbent’s political orientations. The partisan government’s objective function is thus:

$$\Omega = \beta(L_1 U^L_1 + L_2 U^L_2) + (1 - \beta)(U^K_1 + U^K_2),$$

(2)

where $U^L_i = w_i + v(g^L)$ and $U^K_i = \bar{r}_i + v(g^K)$, for $i = 1, 2$, subject to budget constraint

$$\bar{L} g^L + \bar{K} g^K = T,$$

(3)

where $T = \tau_1 k_1 + \tau_2 k_2$. The objective function (2) is a weighted sum of the aggregate welfare of workers and capitalists, where $\beta$ is the weight attached to workers and $(1 - \beta)$ to capitalists. The government’s political orientation is defined by the value of $\beta$: governments with $\beta > 0.5$ have a pro-labor orientation, and those with $\beta < 0.5$ primarily respond to the interests of capitalists.\textsuperscript{12} The budget constraint (3) simply assures

\textsuperscript{10}For simplicity the model assumes that the host government controls only one policy instrument: a tax rate levied on internationally mobile capital. To simplify the analysis we also assume that domestic capital is inelastic to taxes and that the tax is only raised on foreign investment; later we relax this assumption by considering different levels of adjustment costs. Implicitly we assume that the host government can discriminate between different types of capital according to their ability to move across national borders, and label these forms of capital as domestic and foreign.

\textsuperscript{11}This tax could be interpreted as the summation of the numerous policy instruments that governments resort to attract or deter the inflow of foreign investment, such as screening and approval procedures, limits on the share that non-residents are allowed to hold, differential tax schedules, regulatory regimes on sectoral activity and market structure, trade policy, local procurement rules, differential exchange rate regimes. All these instruments and regulations either affect the cost of doing business or the price that firms can charge for their goods and services, and are hence reflected in the firms’ bottom line. For simplicity we assume that all restrictions on mobile investment that the government resorts to would result in revenue that could be used to supply the government output $g^h$ (an in-cash transfer financed with the receipts from taxing foreign investment), thus forcing actors to trade off the utility they derive from this transfer for the income ($y^h$) received from their participation in the market.

\textsuperscript{12}Note that the government’s objective is to maximize the (weighted) utility of workers and domestic capitalists, and not simply their income.
that the government’s tax revenue is enough to finance the in-kind transfers.

At the beginning of the current period, a partisan government, characterized by $\beta \in [0,1]$, chooses taxes and transfers $\{\tau_1, \tau_2, g^L, g^K\}$ for the period that it will be in power. In the next period, a government with a potentially different political orientation $\beta'$ could be in power. This government chooses at the beginning of that period the values of $\{\tau'_1, \tau'_2, g'^L, g'^K\}$ to maximize $\Omega$ conditional on the incumbent’s type.

### 3.4 Timing of events

The model assumes that, at each time period, decisions are taken sequentially as follows: (1) At the beginning of the first period, a partisan government chooses the tax rates in sectors 1 and 2. (2) After observing tax rates, domestic labor and foreign capitalists decide in which sectors to operate. (3) In the next period nature chooses $\beta'[0,1]$, and hence the government chooses tax rates could have a different partisan orientation. (4) Domestic labor and foreign capitalists adjust to the new environment. We find the sub-game perfect Nash Equilibrium of the game. For this, we solve the model using backward induction.

### 4 Second Period: The Firm’s Problem

At the end of the second period, the sectoral allocation of the factors of production is simultaneously determined. The allocation $\{L'_1, k'_1, k'_2\}$ is implicitly determined by

$$f_{k,1}(k'_1, L'_1) - \tau'_1 - r - \phi_1(k'_1 - k_1)/k_1 = 0,$$

$$f_{k,2}(k'_2, L'_2) - \tau'_2 - r - \phi_2(k'_2 - k_2)/k_2 = 0,$$

$$f_{L,1}(k'_1, L'_1) - f_{L,2}(k'_2, L'_2) = 0,$$

considering that $L'_1 = \bar{L} - L'_2$. The equilibrium values of $L'_1$, $k'_1$, and $k'_2$ are functions of $\tau'_1$, $\tau'_2$, $k_1$, $k_2$, $\phi_1$, and $\phi_2$, i.e., $L'_i(x)$ and $k'_i(x)$, for $i = 1, 2$, where $x = (\tau'_1, \tau'_2, k_1, k_2, \phi_1, \phi_2)$. The following comparative static
results are obtained by implicitly differentiating the previous system of equations:

\[
\frac{\partial k'_i}{\partial \tau'_i} = \frac{k_i \left( k_j f'_{k,j} - \phi_j f'_{L,L,i} + f'_{L,L,i} - k_j f'_{k,L,j} \right)}{J'} < 0, \quad (7)
\]

\[
\frac{\partial k'_j}{\partial \tau'_i} = -\frac{k_i f'_{k,k,k,k} f'_{k,L,j}}{J'}, \quad (8)
\]

\[
\frac{\partial L'_i}{\partial \tau'_i} = -\frac{k_i f'_{L,L,1} (k_2 f'_{k,k,2} - \phi_2)}{J'}, \quad \frac{\partial L'_j}{\partial \tau'_i} = \frac{k_i f'_{L,L,2} (k_1 f'_{k,k,1} - \phi_1)}{J'} \quad (9)
\]

where

\[J' = (k_1 f'_{k,k,1} - \phi_1) (k_2 f'_{k,k,2} - \phi_2) (f'_{L,L,1} + f'_{L,L,2}) - (k_2 f'_{k,k,2} - \phi_2) k_1 (f'_{k,k,1})^2 - (k_1 f'_{k,k,1} - \phi_1) k_2 (f'_{k,k,2})^2.\]

Since the production functions are concave in \(k\) and \(L\) (i.e., for fixed values of \(K_i\), \(L'_{L,i} < 0\), and \(f'_{k,k,i} - f'_{L,L,i} = (f'_{L,L,i})^2 > 0, i = 1, 2\)), then \(J' < 0\). Except for the sign of \(\partial k'_i/\partial \tau'_i\), the results depend on the specific technological relationship between the factors of production \(k\) and \(L\) in each sector. For instance, suppose that \(k\) and \(L\) are complements in both sectors, i.e., \(f_{L,L,i} > 0, i = 1, 2\). Then, \(\partial k'_i/\partial \tau'_i > 0\) and \(\partial L'_i/\partial \tau'_i < 0\). The intuition behind these results is straightforward. An increase in \(\tau'_i\) reduces the amount of foreign capital in sector 1. Given that \(k_1\) and \(L_1\) are complements, the marginal productivity of labor in sector 1 declines. Consequently, labor shifts to sector 2. As \(k_2\) and \(L_2\) are also complements, the marginal productivity of foreign capital increases in that sector, attracting foreign capital to sector 2. Similar conclusions apply for changes in \(\tau'_2\) and for different technological relationships between inputs.

By differentiating \(w' \equiv f_{L,i}(k'_i, L'_i)\) with respect to \(\tau'_i\), we can derive the effect of a change in \(\tau_i\) on wages:

\[
\frac{\partial w'}{\partial \tau'_i} = \frac{1}{f'_{L,L,i}} k_i \left( k_j f'_{k,j} - \phi_j f'_{L,L,j} - k_j (f'_{k,L,j})^2 \right) < 0. \quad (10)
\]

Expression (10) shows that the effect of \(\tau'_i\) on \(w'\) only depends on the technological relationship between labor and foreign capital in sector \(i\), represented by \(f'_{L,i}\). In fact, \(\partial w'/\partial \tau'_i\) and \(f'_{L,i}\) have opposite signs. The result can be explained as follows: A higher level of \(\tau'_i\) lowers the amount of foreign capital entering sector \(i\) (shown by (7)). Hence, if labor and foreign capital are substitutes (i.e., \(f'_{L,i} < 0\)), labor productivity is higher, so wages should increase. If they are complements (i.e., \(f'_{L,i} > 0\)), a smaller amount of \(k'_i\) lowers labor productivity in the sector, so wages should decrease.
Next, we examine how tax rates affect income received by domestic capitalists in each sector. Due to the assumption of CRS, the return to domestic capital in sector $i$ is
\[ \bar{r}'_i = q'_i - u'L'_i - f'_{k,i}k'_i, \quad i = 1, 2. \] (11)

From the previous expression, it is straightforward to derive the following results:
\[
\begin{align*}
\frac{\partial \bar{r}'_i}{\partial \tau'_i} &= - \frac{\partial w'}{\partial \tau'_i} L'_i' + \left( 1 + \frac{\phi_1}{k_i} \frac{\partial k'_i}{\partial \tau'_i} \right) k'_i', \\
\frac{\partial \bar{r}'_j}{\partial \tau'_i} &= - \frac{\partial w'}{\partial \tau'_i} L'_j' + \frac{\phi_j}{k_j} \frac{\partial k'_j}{\partial \tau'_i} k'_j', \\
\frac{\partial (\bar{r}'_i + \bar{r}'_j)}{\partial \tau'_i} &= - \frac{\partial w'}{\partial \tau'_i} L'_i' + \frac{\phi_i}{k_i} \frac{\partial k'_i}{\partial \tau'_i} k'_i' + \frac{\phi_j}{k_j} \frac{\partial k'_j}{\partial \tau'_i} k'_j' .
\end{align*}
\] (12)

Changes in tax rates affect domestic capital owners in sectors 1 and 2 differently. Consider first the case of perfect capital mobility, i.e., $\phi_1 = \phi_2 = 0$. Suppose that $L_i$ and $k_i$ are substitutes. Then, both $\bar{r}'_i$ and $\bar{r}'_j$ decrease with $\tau'_i$. The latter also means that total income received by domestic capitalists (i.e., $\bar{r}'_i + \bar{r}'_j$) also decreases with $\tau'_i$. If $L_i$ and $k_i$ are complements, then $\bar{r}'_j$ increases with $\tau'_i$, but the effect on $\bar{r}_i$ is ambiguous. Only when $L'_i$ and $k'_i$ are complements and $|\partial w'/\partial \tau'_i|L > k'_i$ will the total income received by domestic capital increase with $\tau'_i$.

When it is costly for foreign capital to adjust to the new desired level, decisions taken in the first period will have an impact in the second period. It will later become important for our purposes to determine the effect of different levels of foreign capital in the first period, $k_i$, for $i = 1, 2$, on $K$ and $L$ in the second period. The following comparative static results
\[
\begin{align*}
\frac{\partial k'_i}{\partial k_i} &= - \frac{\phi_i k'_i \left( k'_j f'_{k,k,j} - \phi_j \right) \left( f'_{kL,i} + f'_{kL,j} \right) - k'_j \left( f'_{kL,j} \right)^2}{(k_i)^2 \frac{\partial L'_i}{\partial \tau'_i}}, \\
\frac{\partial k'_j}{\partial k_i} &= \frac{\phi_i k'_i k'_j f'_{kL,i} f'_{kL,j}}{(k_i)^2 \frac{\partial L'_i}{\partial \tau'_i}}, \\
\frac{\partial L'_1}{\partial k_1} &= \frac{\phi_1 k'_i f'_{kL,1} f'_{kL,2} - \phi_2}{k_1 f'_{kL,2}} = - \frac{\phi_1 k'_1}{(k_1)^2} \frac{\partial L'_1}{\partial \tau'_1}, \\
\frac{\partial L'_2}{\partial k_2} &= - \frac{\phi_2 k'_2 f'_{kL,2} k_1 f'_{kL,1} - \phi_1}{k_2 f'_{kL,1}} = - \frac{\phi_2 k'_2}{(k_2)^2} \frac{\partial L'_1}{\partial \tau'_2}.
\end{align*}
\] (13, 14, 15, 16)

Finally, higher capital adjustment costs, represented by higher levels of $\phi_i$, will also affect the alloca-
tion of factors of production. The following comparative static results show the relationship between \( \phi_i \) and \( \{k'_1, k'_2, L'_1\} \):

\[
\begin{align*}
\frac{\partial k'_i}{\partial \phi_i} &= \frac{(k'_i - k_i) \left[ (k'_j f'_{kk,j} - \phi_j)(f'_{LL,i} + f'_{LL,j}) - k_j (f'_{kL,j}) \right]^2}{J'} = \frac{(k'_i - k_i) \partial k'_i}{k_i \partial \tau'_i}, \\
\frac{\partial k'_j}{\partial \phi_i} &= -\frac{(k'_i - k_i) k'_j f'_{kL,i} f'_{kL,j}}{J'} = \frac{(k'_i - k_i)}{k_i} \frac{\partial k'_j}{\partial \tau'_i}, \\
\frac{\partial L'_1}{\partial \phi_i} &= -\frac{(k'_1 - k_1) f'_{kL,1} (f'_{kk,2} k'_2 - \phi_2)}{J'} = \frac{(k'_1 - k_1)}{k_1} \frac{\partial L'_1}{\partial \tau'_1}, \\
\frac{\partial L'_1}{\partial \phi_2} &= \frac{(k'_2 - k_2) f'_{kL,2} (f'_{kk,1} k'_1 - \phi_1)}{J'} = \frac{(k'_2 - k_2)}{k_2} \frac{\partial L'_1}{\partial \tau'_2}.
\end{align*}
\]

### 5 Second Period: The Government’s Problem

At this stage, governments, characterized by different political orientations (pro-labor or pro-capital), decide the optimal values of \( \{\tau'_1, \tau'_2, g'_L, g'_K\} \) anticipating the behavior of labor and foreign capital owners, i.e., considering their responses represented by the functions \( L'_1(x) \) and \( k'_i(x) \), for \( i = 1, 2 \). Specifically, a partisan government maximizes\(^{13}\)

\[
\Omega' = \beta' (L'_1 U'_{1} + L'_2 U'_{2}) + (1 - \beta')(U'_{1} K' + U'_{2} K'),
\]

with respect to \( \{\tau'_1, \tau'_2, g'_L, g'_K\} \), subject to the government’s budget constraint \( \bar{L} g'_L + \bar{K} g'_K = T' \), with \( T' = \tau'_1 k'_1 + \tau'_2 k'_2 \). Additionally, as explained in the previous section, in equilibrium \( w'_1 = w'_2 = w' \) because labor is mobile across sectors, but \( \bar{r}'_1 \) and \( \bar{r}'_2 \) are not necessarily equalized given that \( K_1 \) and \( K_2 \) are fixed factors.\(^{14}\) Denoting with \( \lambda' \) the Lagrange multiplier associated with the budget constraint, the first-order

\(^{13}\)The maximization problem stated in the paper is similar to the problem of optimal indirect taxation when the government has redistributive considerations.

\(^{14}\)We do not restrict tax rates to be non-negative. However, it is clear that they cannot be negative or zero in both sectors at the same time.
conditions are:

\[
\tau'_1 : \quad \beta_2 \frac{\partial w'}{\partial \tau'_1} \bar{L} + (1 - \beta') \left( \frac{\partial v'_1}{\partial \tau'_1} + \frac{\partial v'_2}{\partial \tau'_1} \right) + \lambda' \frac{\partial T'}{\partial \tau'_1} = 0, \tag{17}
\]

\[
\tau'_2 : \quad \beta_2 \frac{\partial w'}{\partial \tau'_2} \bar{L} + (1 - \beta') \left( \frac{\partial v'_1}{\partial \tau'_2} + \frac{\partial v'_2}{\partial \tau'_2} \right) + \lambda' \frac{\partial T'}{\partial \tau'_2} = 0, \tag{18}
\]

\[
g^{L,t} : \quad \beta' v'(g^{L,t}) - \lambda' = 0, \tag{19}
\]

\[
g^{K,t} : \quad (1 - \beta') v'(g^{K,t}) - \lambda' = 0, \tag{20}
\]

\[
\lambda' : \quad T' - \bar{L} g^{L,t} - \bar{K} g^{K,t} = 0, \tag{21}
\]

where

\[
\frac{\partial T'}{\partial \tau'_1} = \tau'_1 \frac{\partial k'_1}{\partial \tau'_1} + \tau'_2 \frac{\partial k'_2}{\partial \tau'_1} + \tau'_j \frac{\partial k'_j}{\partial \tau'_1} \tag{22}
\]

is the change in tax revenue due to a change in \(\tau'_1\).\(^{15}\) The system of equations (17) - (21) determine the optimal values \(\{\tau'^*_1, \tau'^*_2, g^{L,t}, g^{K,t}, \lambda'\}\) as a function of the exogenous parameters. Since, the focus of our analysis is to examine the relationship between these variables and \(\beta'\) and \(k_i, i = 1, 2\), we use the notation \(\tau'^*_i = \tau'^*_i(k_1, k_2, \beta'), g^{h,t} \equiv g^{h,t}(k_1, k_2, \beta'), h = L, K,\) and \(\lambda'^* = \lambda'(k_1, k_2, \beta').\)

Equations (19) and (20) simply establish the rule followed by the government to distribute the tax revenue across individuals: \(g^{L,t}\) and \(g^{K,t}\) are such that \(\beta' v_g(g^{L,t}) = (1 - \beta') v_g(g^{K,t}) = \lambda'\), or alternatively \([v_g(g^{K,t})/v_g(g^{L,t})] = [\beta'/(1 - \beta')].\) If \(\beta' > 1/2\), then \(v_g(g^{K,t}) > v_g(g^{L,t})\), which implies that \(g^{K,t} < g^{L,t}\) given that \(v_{gg} < 0\). As a result, governments with higher values of \(\beta'\) will distribute \(g'\) in favor of labor.

Equations (17) and (18) can be rewritten as

\[
b'_L \left[ \frac{(\partial w' / \partial \tau'_1) \bar{L} + k'_1}{k'_1} \right] - b'_K \left[ \frac{(\partial w' / \partial \tau'_1) \bar{L}}{k'_1} \right] = \frac{\partial T' / \partial \tau'_1}{k'_1}, \tag{23}
\]

where \(b'_L = \beta'/\lambda'\) and \(b'_K = (1 - \beta')/\lambda'\) are the government’s valuation of a change in workers’ and capitalists’ income, respectively (measured in terms of government revenue). They measure the government’s marginal benefit of transferring $1 to household \(h = L, K,\). The expressions between square brackets on the left-hand

\(^{15}\)We assume that the welfare weights attached to \(L\) and \(K\) are the same across sectors. It can also be assumed that governments are identified with workers or domestic capitalists operating in specific sectors, which would require using different welfare weights for each group in each sector. As labor is mobile and wages are equalized across sectors, the latter is irrelevant for \(L\). It would still seem reasonable, though, to consider different weights for the fixed factors \(K_1\) and \(K_2\). For simplicity, we assume that domestic capitalists are treated identically regardless of the sector where they operate.
side represent the proportional change in income for group $h$ when $\tau'_i$ is modified. The right-hand side is the increase in tax revenue due to an increase in $\tau'_i$ as a proportion of the tax base. We can also write (23) as follows:

$$b'_K + (b'_K - b'_L) \left\{ \frac{(\partial w'/\partial \tau'_i) \bar{L}}{k'_L} \right\} = \frac{\partial T'/\partial \tau'_i}{k'_L}. \quad (24)$$

Note that if $b'_K = b'_L = b'$, then the left-hand side does not depend on $i$, implying that the tax rates are such that the proportional change in tax revenue due to a change in $\tau'_i$ should be equalized across all sectors, i.e., $(\partial T'/\partial \tau'_i)/k'_1 = (\partial T'/\partial \tau'_i)/k'_2$.

In general, when $b'_K \neq b'_L$, the expression $(\partial w'/\partial \tau'_i) \bar{L}/k'_1$ will also affect the choice of the tax rates. Unfortunately, these rules only suggest general observations about the structure of the tax rates, but it is not possible to obtain precise implications. However, the following statements can be made when a smaller value of $(\partial T'/\partial \tau'_i)/k'_1$ is consistent with a higher $\tau'_i$, while a larger $(\partial T'/\partial \tau'_i)/k'_1$ is consistent with a lower $\tau'_i$.

Suppose that initially $b'_L = b'_K$ and consider a small increase in the value of $\beta'$ and $b'_L$ (or lower $(1 - \beta')$ and $b'_K$), representing a shift towards a government that values relatively more the well-being of labor. Then, the left-hand side of (24) decreases for those sectors where labor and foreign capital are substitutes given that $\partial w'/\partial \tau'_i > 0$, implying a smaller value of $(\partial T'/\partial \tau'_i)/k'_1$ and, consequently, higher tax rates. In sectors where domestic labor and foreign capital are complements, the first term on the left-hand side of (24) decreases with $\beta'$, but the second term is negative because $\partial w'/\partial k'_i < 0$. In this way, tax rates in those sectors can either go up or down as $\beta'$ gets bigger. The opposite effect takes place when we move from $b'_L = b'_K$ to a higher $b'_K$.\footnote{Suppose, for instance, that the function $T'$ increases at a decreasing rate with $\tau'_i$ (i.e., $\partial T'/\partial \tau'_i$ declines when $\tau'_i$ becomes higher). Since $\partial k'_i/\partial \tau'_i < 0$, then $(\partial T'/\partial \tau'_i)/k'_i$ unambiguously increases when $\tau'_i$ gets larger.}

In conclusion, the following pattern of tax rates on foreign capital across sectors would be expected. On one hand, tax rates decided by pro-labor governments should be relatively higher than the corresponding tax rates chosen by pro-capital governments in sectors where labor and foreign capital are substitutes. On the other hand, when pro-labor governments are in power, tax rates in sectors where these factors are complements could be either higher or lower than the tax rates chosen by pro-capital governments in those same sectors.\footnote{Notice that in this section we are explaining the use of different tax rates for a given sector for countries with different partisan orientations. Within a country, the relationship between tax rates across sectors (i.e., whether capital flowing into a given sector receives a higher tax rate relative to other sectors) is basically explained by the elasticities of capital in each sector with respect to $\tau_i$.}

Additionally, tax rates also depend on the amount of foreign capital operating in each sector in the
first period. The next section addresses this issue.

6 First Period: The Firm’s Problem

At the end of the first period, foreign capital in each sector will move until the sum of the first-period net return and the discounted second-period net return is equalized to the opportunity cost, given by \( r \). Since domestic labor is completely mobile across sectors, wages should also be equalized in equilibrium. Hence, the following system of equations determine the equilibrium values \( \{k_1, k_2, L_1\} \):

\[
\begin{align*}
    f_{k,1}(k_1, L_1) - \tau_1 - r + \delta [f_{k,1}(k_1^*, L_1^*) - \tau_1^*] &= 0, \quad (25) \\
    f_{k,2}(k_2, L_2) - \tau_2 - r + \delta [f_{k,2}(k_2^*, L_2^*) - \tau_2^*] &= 0, \quad (26) \\
    f_{L,1}(k_1, L_1) - f_{L,2}(k_2, L_2) &= 0, \quad (27)
\end{align*}
\]

where \( \delta \) is the discount factor, \( L_2 = \bar{L} - L_1 \), and

\[
L_1^* \equiv L_1^*(k_1, k_2, \tau_1^*, \tau_2^*), \quad k_i^* \equiv k_i^*(k_1, k_2, \tau_1^*, \tau_2^*), \quad \tau_i^* \equiv \tau_i^*(k_1, k_2, \beta'), \quad i = 1, 2. \quad (28)
\]

7 First Period: The Government’s Problem

At the beginning of the first period, a partisan government characterized by \( \beta \) decides the optimal policy for that period, considering that \( \{k_1, k_2, L_1\} \) are determined by the system (25)-(27). Note that even though governments are only concerned about the current well-being of their political base, their decisions will have implications in the future.

8 Numerical Example

To illustrate the implications of the theoretical model introduced earlier, we compute several examples using specific functional forms. In particular, our objective is to examine how tax rates on foreign capital across sectors chosen by pro-labor governments differ from those imposed by pro-capital governments and how these
choice depend on the capital mobility costs. In doing so, we also examine the role played by the degree of substitutability between domestic labor and foreign capital.

8.1 Description of the numerical example

In the examples, we use the following functional specifications. First, the utility function is defined by $U_h = y_h + b \ln(g_h)$, for $h = L, K$, with $b > 0$. Second, the production technology is represented by the following production function:\textsuperscript{18}

$$q = AK^\alpha [L^\sigma + ak^\sigma]^{(1-\alpha)/\sigma},$$

(29)

where $\alpha \in (0, 1)$, $\sigma \in (-\infty, 1)$, and $a > 0$. The production function has the following characteristics. The parameter $a$ is the effectiveness of foreign capital relative to domestic labor. The production function is a CRS Cobb-Douglas function in the inputs $K$ and the composite term $[L^\sigma + ak^\sigma]^{1/\sigma}$. The function allows for different substitution possibilities across factors, determined by the parameter $\sigma$. In fact, the elasticity of substitution between domestic labor and foreign capital is $1/(1-\sigma)$\textsuperscript{19}. In section (4), we define complementarity and substitutability between domestic labor and foreign capital in terms of the sign of $f_{Lk}$: if $f_{Lk} > 0$, they are complements, and if $f_{Lk} < 0$, they are substitutes. When the production function is specified as in (29), the following relationship between $\sigma$, $\alpha$ and $f_{Lk}$ holds:

$$f_{Lk} = \frac{(1-\alpha-\sigma)}{(1-\alpha)} \frac{f_L f_k}{q}.$$  

(30)

The latter implies that when $\sigma < (1-\alpha)$, then $k$ and $L$ are necessarily complements, while when $\sigma > (1-\alpha)$, they are substitutes.

In the numerical example, we adopt the following approach. In the first period, a government characterized by a value of $\beta = 0.5$ decides the policy that maximizes the welfare of their constituents. In

\textsuperscript{18}We use a similar specification as the one employed by Katz and Murphy (1992), Krussel et al (2000), and Ciccone and Peri (2003). The functional form is the same for each sector, but the parameters may differ. In fact, the numerical examples will consider the effect on the policy variables when $\sigma$ differs across sectors.

\textsuperscript{19}$\sigma$ also indirectly affects the elasticities of substitution between domestic capital and labor and between domestic capital and foreign capital. These elasticities are not constant and are given, respectively, by

$$\varepsilon_{KL} = \frac{\alpha L^\sigma + ak^\sigma}{\alpha L^\sigma (1-\sigma) + ak^\sigma} \quad \text{and} \quad \varepsilon_{Kk} = \frac{L^\sigma + ak^\sigma}{L^\sigma + ak^\sigma (1-\sigma)}.$$
the next period, we consider three alternatives: (i) the political orientation of the government deciding the policy in the second period is the same as the one in the first period, i.e., $\beta' = 0.5$; (ii) the government in the second period is relatively more pro-capital, i.e., $\beta' = 0.4$; and (iii) the government in the second period is relatively more pro-labor, i.e., $\beta' = 0.6$.

8.2 Results

Tables 1, 2, and 3 summarize the results obtained in different numerical simulations for different assumptions regarding the technological relationship between factors of production and mobility costs. We assume, for the moment, that sectors are completely identical. The parameter values are listed at the bottom of each table. The following conclusions can be derived from the numerical exercise.

First, Table 1 shows the results when domestic labor and foreign capital are substitutes. Consider the case $\phi_1 = \phi_2 = 0$. When the government becomes more pro-capital, tax rates tend to decline, while when it becomes more pro-labor, they tend to increase. If it is costly to change the level of capital in the second period, specifically, if $\phi_1 = \phi_2 = 0.125$, then both the first and second period tax rates increase. Once capital mobility costs are positive, decisions in one period affect the variables of the other period. When $\beta = \beta' = 0.5$, tax rates are 0.1263 in each sector in the first period, and 0.2027 in the second. If a government with $\beta = 0.5$ is followed by one with $\beta' = 0.4$, then the first and the second period tax rates are lower, 0.1248 and 0.1963, respectively. Tax rates are higher if a pro-labor government with $\beta' = 0.6$ follows one with $\beta = 0.5$. In the latter case, tax rates becomes 0.1281 and 0.2103.

Second, Tables 2 and 3 present two cases where factors of production are complements. Table 2 shows that when capital mobility costs are zero, tax rates decline when the political orientation of the government changes from $\beta = 0.5$ to $\beta' = 0.6$, while they become higher when $\beta' = 0.4$. When capital mobility costs are positive tax rates are lower than those implemented when $\phi_1 = \phi_2 = 0$. Also when $\phi_1 = \phi_2 = 0.010$ and the government becomes more pro-labor, tax rates in each period are lower relative to those chosen by governments with either $\beta' = 0.5$ or $\beta' = 0.4$. In Table 3 tax rates are also smaller when capital mobility costs are positive. The difference with the previous table is that now tax rates increase when the government becomes more pro-labor and decline when it becomes more pro-capital.

\footnote{We will later consider cases where sectors are asymmetric.}
9 Conclusions

Recent work on the political determinants of FDI has found preliminary evidence that, controlling for the determinants of capital flows identified in the literature, aggregate FDI inflows tend to be larger to governments that cater to labor (Pinto 2004, 2005). Those models were motivated by the assumption that foreign capital is more likely to increase labor demand. Yet we have reason to believe that this assumption depends on the technology associated with capital inflows, which could either complement or substitute for labor and capital in the host, leading to starkly different distributive consequences.

In Pinto and Pinto (2008), we argued that different forms of FDI react differently to political incentives, and hence predicted the existence of partisan cycles in the flow of foreign direct investment to different industries. In host countries governed by the left, FDI will flow to sectors where it is a complement of labor, such as manufacturing. Moreover we expected that capital will be attracted to those sectors where foreign capital is a complement of capital, hence substituting for labor, when the right/pro-business party is in power. In that paper we modeled the interaction between governments and investors as a static game aimed at capturing the long-term equilibrium allocation of investment when costs of relocation tend to zero. We have, hence, abstracted from adjustment costs and time consistency problems faced by investors and governments respectively in their strategic interaction.

In the present work we extend the model by adding this dynamic element to analyze the effect of partisanship on the regulation of FDI. Our modeling strategy allows us to identify the conditions under which higher costs of redeployment will affect the incentives to tax foreign investment more heavily, rendering the predictions from the obsolescing bargain literature as a sub-case in the broader framework that we defined as the politics of investment. We can also show irrespective of the costs of adjustment that investors face the incumbents have an incentive to tax more heavily foreign capital that is substitute in production to the incumbents’ core constituents, i.e.: the pro-labor government will, for instance, tax more heavily foreign capital that is associated with the introduction of labor saving technologies, as predicted by our earlier work. We are also able to identify conditions under which in the second period the pro-labor will offer better investment conditions -in the form of lower taxes in our stylized model- to investment that raises labor demand, and hence wages. How much those taxes are reduced depends on the the marginal rate of substitution of direct income through higher wages, and the utility derived by labor from government

\footnote{In Pinto & Pinto 2007, we analyze the consequences of adding employment effects to the analysis of the political economy of FDI when the incumbent has partisan motivations.}
transfers. We can also predict that as the probability that the incumbent will be replaced in the the second period increases the rate of return offered to foreign investors in the first stage should compensate them for their cost of redeployment. As discussed earlier, the rate of return offered by the pro-labor government should high enough to sustain profitability during its tenure when redeployment costs are sufficiently high. In the second period the pro-labor government that succeeds a pro-capital one should offer investors that complement labor in production an even lower tax rate than it would have offered in the first period, to lure that investor in. Thes predictions are consistent with our findings on the differential sectoral allocation of FDI in OECD countries as the orientation of the incumbent changed, and the positive effect of FDI on wages under the left (see Pinto & Pinto 2008). In future research we intend to explore the effect of allowing investors to adjust technology to changing political conditions to maximize rate of return conditional on the orientation of the incumbent.
Table 1: Substitutes

\[ \phi_1 = \phi_2 = 0 \]

<table>
<thead>
<tr>
<th>Period</th>
<th>0.4</th>
<th>0.5</th>
<th>0.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \beta' )</td>
<td>( \tau_1 )</td>
<td>0.0749</td>
<td>0.0749</td>
</tr>
<tr>
<td>( \beta' )</td>
<td>( \tau_2 )</td>
<td>0.0749</td>
<td>0.0749</td>
</tr>
<tr>
<td>( \beta' )</td>
<td>( k_1 )</td>
<td>0.7550</td>
<td>0.7550</td>
</tr>
<tr>
<td>( \beta' )</td>
<td>( k_2 )</td>
<td>0.7550</td>
<td>0.7550</td>
</tr>
<tr>
<td>( \beta' )</td>
<td>( g^L )</td>
<td>0.0377</td>
<td>0.0377</td>
</tr>
<tr>
<td>( \beta' )</td>
<td>( g^K )</td>
<td>0.0377</td>
<td>0.0377</td>
</tr>
</tbody>
</table>

\[ \phi_1 = \phi_2 = 0.125 \]

<table>
<thead>
<tr>
<th>Period</th>
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<th>0.5</th>
<th>0.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \beta' )</td>
<td>( \tau_1 )</td>
<td>0.1248</td>
<td>0.1263</td>
</tr>
<tr>
<td>( \beta' )</td>
<td>( \tau_2 )</td>
<td>0.1248</td>
<td>0.1263</td>
</tr>
<tr>
<td>( \beta' )</td>
<td>( k_1 )</td>
<td>0.4994</td>
<td>0.4879</td>
</tr>
<tr>
<td>( \beta' )</td>
<td>( k_2 )</td>
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<td>0.4879</td>
</tr>
<tr>
<td>( \beta' )</td>
<td>( g^L )</td>
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<td>0.0411</td>
</tr>
<tr>
<td>( \beta' )</td>
<td>( g^K )</td>
<td>0.0415</td>
<td>0.0411</td>
</tr>
</tbody>
</table>

\[ \beta = 0.5; r = 0.05; A_1 = A_2 = 1; \alpha_1 = \alpha_2 = 0.85; \]
\[ \sigma_1 = \sigma_2 = 0.525; \delta = 0.80; b = 0.30. \]
Table 2: Complements: Case I

<table>
<thead>
<tr>
<th>$\beta'$</th>
<th>0.4</th>
<th>0.5</th>
<th>0.6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$t$</td>
<td>$t + 1$</td>
<td>$t$</td>
</tr>
<tr>
<td>$\phi_1 = \phi_2 = 0$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\tau_1$</td>
<td>0.1489</td>
<td>0.1523</td>
<td>0.1489</td>
</tr>
<tr>
<td>$\tau_2$</td>
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<td>0.1523</td>
<td>0.1489</td>
</tr>
<tr>
<td>$k_1$</td>
<td>0.3012</td>
<td>0.2957</td>
<td>0.3012</td>
</tr>
<tr>
<td>$k_2$</td>
<td>0.3012</td>
<td>0.2957</td>
<td>0.3012</td>
</tr>
<tr>
<td>$g^L$</td>
<td>0.0299</td>
<td>0.0225</td>
<td>0.0299</td>
</tr>
<tr>
<td>$g^K$</td>
<td>0.0299</td>
<td>0.0338</td>
<td>0.0299</td>
</tr>
</tbody>
</table>

| $\phi_1 = \phi_2 = 0.010$ |
| $\beta'$ | 0.4   | 0.5   | 0.6   |
|          | $t$   | $t + 1$ | $t$ | $t + 1$ | $t$ | $t + 1$ |
| $\tau_1$ | 0.0688 | 0.1504 | 0.0687 | 0.1472 | 0.0686 | 0.1436 |
| $\tau_2$ | 0.0688 | 0.1504 | 0.0687 | 0.1472 | 0.0686 | 0.1436 |
| $k_1$    | 0.7421 | 0.3083 | 0.7429 | 0.3138 | 0.7439 | 0.3200 |
| $k_2$    | 0.7421 | 0.3083 | 0.7429 | 0.3138 | 0.7439 | 0.3200 |
| $g^L$    | 0.0340 | 0.0232 | 0.0340 | 0.0308 | 0.0340 | 0.0394 |
| $g^K$    | 0.0340 | 0.0348 | 0.0340 | 0.0308 | 0.0340 | 0.0263 |

Parameter values:

$\beta = 0.5; r = 0.06; A_1 = A_2 = 1; \alpha_1 = \alpha_2 = 0.505; 
\sigma_1 = \sigma_2 = -0.35; \delta = 0.70; b = 0.15.$
Table 3: Complements: Case II

<table>
<thead>
<tr>
<th>Period</th>
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<th>$\phi_1 = \phi_2 = 0.070$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta'$</td>
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<td>0.5</td>
</tr>
<tr>
<td>$\tau_1$</td>
<td>0.1318</td>
<td>0.1216</td>
</tr>
<tr>
<td>$\tau_2$</td>
<td>0.1318</td>
<td>0.1216</td>
</tr>
<tr>
<td>$k_1$</td>
<td>1.6011</td>
<td>1.6671</td>
</tr>
<tr>
<td>$k_2$</td>
<td>1.6011</td>
<td>1.6671</td>
</tr>
<tr>
<td>$g^L$</td>
<td>0.1407</td>
<td>0.1014</td>
</tr>
<tr>
<td>$g^K$</td>
<td>0.1407</td>
<td>0.1520</td>
</tr>
</tbody>
</table>

Parameter values:

$\beta = 0.5; r = 0.22; A_1 = A_2 = 1; \alpha_1 = \alpha_2 = 0.670; \sigma_1 = \sigma_2 = 0.20; \delta = 0.76; b = 0.29.$
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