

# The Politics of Investment: Partisan Governments, Wages and Employment\*

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## Abstract

In this paper, we extend the model developed by Pinto & Pinto (2006) by considering the simultaneous effects of foreign investment flows on both wages and employment. We model the host government's objective function as a convex combination of wages, employment and profits. Next, we solve for the optimal policy bundle of taxes offered by the incumbent to foreign investors and the level of unemployment benefits offered to workers in different sectors of the economy. The entry of foreign investment in the model is conditioned to the outcome of a wage bargaining process between firms and labor in each industry. This modeling strategy allows us to derive the following results: First, pro-labor (pro-capital) governments will favor the entry of foreign investment when labor (domestic capital) and foreign investment are complements in production. Second, the endogenously determined amounts of foreign investment flowing into different sectors of the host country have qualitatively different effects on wages and employment levels in those sectors. When foreign investment and labor are substitutes in production, the restrictions on foreign capital imposed by a pro-labor host government could lead to higher wages and either an increase or a decrease in employment levels in each sector of the host country. When labor and foreign investment are complements, on the other hand, lower restrictions on foreign capital offered by the pro-labor government leads to higher inflows that result in higher or lower wages combined with positive or negative changes in sectoral employment levels. The ambiguity is driven by different degrees of complementarity between labor and foreign investment. Third, in general workers and domestic capitalists will clash on their preferred foreign investment regime. The model also predicts the conditions under which we would expect the emergence of a cross-class coalition around the regulation of foreign investment. Yet we find that under no conditions will higher restrictions to foreign investment in a specific sector be unanimously supported by owners of labor and capital.

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# 1 Introduction

Most countries have liberalized their foreign investment regimes in recent years. Some governments go even farther: they adopt selective policies aimed at attracting foreign direct investment (FDI) and enhancing the positive effects from the activity of multinational corporations in their economies. To promote FDI inflows in general, or specific types of investment in particular, these host governments resort to a number of financial, fiscal and other policy instruments. Common practices used to attract FDI include lowering tax rates and extending tax holidays, granting partial or complete exemptions from import duties, and preferential access to foreign exchange, real estate, infrastructure and training programs, or simply offering direct subsidies. The level and intensity of these FDI promoting activities vary dramatically across countries, sectors and over time.<sup>1</sup> Typically local firms have been excluded from the benefits and incentives granted to MNCs; yet frequently host governments resort to fiscal, financial and other forms of regulation to discriminate against foreign investors.<sup>2</sup>

There is debate in the literature on whether those policies are a decisive factor in the sectoral and cross-country allocation of foreign investment, but it is widely accepted that they are likely to affect the activity of MNCs.<sup>3</sup> The differential effects of those policies on aggregate welfare, wages, employment, and domestic firms' productivity and profits are likely to arouse heated political debates on the desirability of granting foreign investors unrestricted access to markets and resources in the host economy.<sup>4</sup> In this

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<sup>1</sup>Hanson provides a detailed description of investment promotion practices (Hanson 2001, pp. 3-9). See also UNCTAD 2001, 2003

<sup>2</sup>In the early 1990s, for instance, the Argentine government granted foreign investors a number of incentives to participate in the privatization of utilities, or to establish production facilities in the country, including VAT and import duty tax exemptions; the VAT exemptions were in part offered to some domestic firms in manufacturing as well, provided that they exported their production. The 1973 Foreign Investment Statute, on the other hand, discriminated against firms where foreign investors had a controlling interest (above 50 percent of the shares) limiting their access to industrial promotion regimes (Pinto 2004, pp. 144). Moreover, Azpiazu and Basualdo (1989) show that despite the national treatment provision in the foreign investment regime adopted by the military government after the 1976 coup, foreign investors did not have equal access to subsidies under the industrial promotion regime.

<sup>3</sup>Hines (1999) discusses the extensive quantitative and anecdotal evidence that suggest that international taxation influences the volume and location of FDI. Contrary to earlier work by Wheeler and Mody (1992) and Brainard (1997), Hines (1997) finds that the elasticity of FDI to taxes is close to one. See Hines (1997, 1999) for a review of the literature on taxation and FDI.

<sup>4</sup>On technology and productivity spillovers of multinationals, and the effect of FDI on labor productivity, employment, wages and the return to domestic firms see Haddad & Harrison (1993), Aitken et al. (1997), Borensztein et al. (1998)

paper we develop a theoretical framework aimed at explaining the political determinants and consequences of the regulation of foreign direct investment inflows. This framework allows us to analyze the conditions under which governments will adopt policies to lure foreign investment into different sectors of their economies, and whether the effects of endogenously determined investment flows will result in higher or lower wages, profits and employment in those sectors.

In earlier work we provided a political economy explanation of the variance in the regulatory regimes towards foreign investors. We explored the existence of partisan cycles in foreign direct investment, and in investment performance. We argued that the incumbent's partisanship -i.e.: its allegiance to labor or capital- would affect foreign investors' behavior, which should be reflected in their decision to enter the host country (Pinto 2004) or to flow into different sectors of the economy (Pinto & Pinto 2006). We assumed that left-leaning/pro-labor governments would internalize the preferences of owners of labor in the economy, hence encouraging FDI inflows that would complement labor in production; right-leaning governments, on the other hand, would internalize the interests of domestic businesses encouraging investment inflows that are more likely to complement domestic capital in production, generate positive spillovers effects on domestic businesses, and/or introduce labor saving technologies.<sup>5</sup>

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.<sup>6</sup> Yet, as discussed in that paper, 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.<sup>7</sup> Still, the differential pattern

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Aitken & Harrison (1999).

<sup>5</sup>In fact, we theorize that domestic business interests would strictly prefer technology transfer agreements to investment capital inflows.

<sup>6</sup>Using data for a subset of OECD countries from 1980 to 2000 disaggregated at the industry level we found that the pattern of FDI inflows covaries with the ideological orientation of the incumbent. Table 1 in the Appendix reproduces the summary of the effect of left orientation of the incumbent on direct investment performance in 17 sectors for the OECD sample. The dependent variable is FDI into the sector as a proportion of investment in country  $j$  and year  $t$ . All regressions include controls for country size (population), level of development (GDP per capita), degree of openness, country and year fixed effects. See Pinto & Pinto (2006) for a description of variables used, data sources and model specifications.

<sup>7</sup>See Pinto & Pinto (2006), pp. 17-19, for a discussion on the constraints we faced in designing a direct test of our

of sectoral allocation of FDI under left and right-leaning governments is indeed consistent with the predictions from our model. To the extent that domestic capital is mobile across sectors the inflow of foreign investment that complements labor in one sector could have a positive effect on the return to labor economy wide. Hence, the positive correlation between left orientation of the government and inflows, on one side, and economy-wide wages on the other, suggests that the argument is plausible.<sup>8</sup>

Yet the emphasis on wages and factor return should not be overstated. Journalistic accounts on the activity of multinational corporations, and political debates around the politics of FDI usually stress on the effects of foreign investment on employment. Moreover, in the academic realm, there is clear empirical evidence that the quantity and quality of employment generated by domestic and foreign investment is systematically different.<sup>9</sup> Our own preliminary analysis suggests that the wage effects predicted in our earlier model might not attain in the absence of full employment at the economy and industry levels. In Table 3 we reproduce the signs and significance levels of the partial correlation coefficients obtained from regressing the change in wages normalized by value added in the sector (and sectoral employment levels normalized by country population), on one hand, and foreign investment inflows into each industrial sector for a sub-sample of the data when the left-leaning party is in power.<sup>10</sup> These results suggest that when the left is in power sectoral FDI inflows are likely to have differential effects on sectoral wages and employment.

Hence, we deem necessary to explicitly account for those employment effects in our analysis of the the politics of foreign investment.<sup>11</sup> This is what we do in section

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model. 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.

<sup>8</sup>Table 2 reproduces the results of this test. The dependent variable  $\Delta \ln(Wage/Emp)$  is the change in the natural log of average wages for country  $j$  at time  $t$ . The coefficients on Left, Inflows and the interaction term suggest that when the left is in power FDI inflows have a positive effect on economy-wide wages, which is supportive of our predictions.

<sup>9</sup>See Lipsey (2004), Hanson (2001) for a review of this literature.

<sup>10</sup>The signs and significance levels obtained by fitting OLS models with robust standard errors corrected for panel effects on the sub-sample of country and years when the incumbent government is coded as Left in the Database of Political Institutions. All regressions include year dummies. Note that this analysis is very preliminary. Detailed results and data sources are available from the authors.

<sup>11</sup>While throughout the paper we use the term foreign investment, the intuition is applicable to other forms of *internationally mobile* investment.

3, where we model the host government's objective function as a convex combination of wages, employment and the return to domestic capital owners. The weights placed on employment and/or factor return depends on the incumbent's pro-labor or pro-business stance. Next, we solve for the optimal policy bundle of taxes offered by the incumbent to foreign investors and the level of unemployment benefits offered to workers. As in the previous paper, we show that the host government's choice of investment regime depends on the technological relationship between foreign capital and factors of production in the host economy, i.e.: their degree of complementarity or substitutability in production. The pro-labor government, for instance, adopts policies to encourage the inflow of foreign investment that is a complement of labor in production; this is the type of investment that could have a positive effect on wages and/or employment. Foreign investors respond to the policy choices made by incumbents by flowing into different sectors of the economy, or staying out. The choice to grant a lower tax to foreign investors, in turn, is constrained by the need to fund the level of unemployment benefits offered to owners of labor. We derive the conditions under which the endogenously determined foreign investment inflows ultimately affect the returns to factors of production (wages and returns to capital) and the quantities of labor employed.

The model allows us to derive several substantively relevant results. First, we show the existence of equilibria with different investment allocation depending on the incumbent's orientation: pro-labor governments will favor the entry of foreign capital when labor and foreign capital are complements in production.<sup>12</sup> Second, whether the effect of the entry of foreign investment affects wages or employment is conditioned by the outcome of a wage bargaining process between domestic firms and workers. As foreign investment moves into the host country the consequences can be qualitatively different in terms of the final effect on wages and employment levels. For instance, when labor and foreign capital are substitutes, and governments are of the pro-labor type, the restrictions imposed on foreign capital could lead to higher wages and either high or low levels of

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<sup>12</sup>This is consistent with the findings in Pinto & Pinto (2006)

employment in different sectors of the host country. When labor and foreign investment are complements, on the other hand, lower restrictions on foreign capital could lead to higher inflows that result in higher or lower wages combined with either high or low employment levels. The ambiguity is driven by different degrees of complementarity between labor and foreign investment.

Third, in general workers and domestic capitalists will clash on their preferred foreign investment regime. We do identify some conditions under which both labor and capital favor the entry of foreign capital (characterized as a lower tax schedule in the stylized model). However, under no conditions will higher restrictions to foreign investment be unanimously supported by both groups.

The controversy over the likely consequences and effects of MNC activity discussed in section 2 underscores the main point of our research agenda: governments are actively engaged in regulating the inflow of foreign investment. Whether foreign investment affects wages, profits and employment is likely to depend on the technological characteristics of the firm and industry. To the extent that economic actors are able to identify and internalize those consequences, and are willing to act politically on them, we should expect them to demand policies to protect their source of income. Partisan governments would, thus, enact policies that account for the preferences of their core constituents and internalize the likely response of foreign investors. Whether foreign investors pay higher wages, foster better labor relations with unions, create employment, or transfer technology and know-how to domestic firms is likely to reflect investors' strategic internalization of the expected behavior of political actors, and hence their best response to political/partisan conditions in the host country.

This paper is organized as follows: the following section places the paper in the literature. Section 3 presents our conceptual framework. We derive the main results in sections 4 and 5. The last section concludes and discusses possible extensions.

## 2 Partisanship and the Distributive Effects of FDI

The assumption that governments have partisan (and electoral) incentives in regulating economic activity is ubiquitous in the literature on politics and macro-economic performance. Hibbs (1977, 1992), Tufte (1978), Esping-Andersen (1990), Goldthorpe (1984), among others, are precursors in this tradition.<sup>13</sup> We adopt the same approach and assume that parties of the left will try to advance the political agenda of owners of labor, while parties of the right are identified with the interests of domestic business owners. Moreover, we argue that this argument follows because foreign investment is likely to affect differently the return to domestic factors of production, potentially creating a distributive cleavage in the regulation of FDI. Our argument is consistent with that found in the earlier literature on the link between investment and trade politics.<sup>14</sup> In their analysis of quid-pro-quo FDI, for instance, Bhagwati et al. argue that among those actors supporting the trade policy position of multinationals we usually find business groups brought into joint-ventures with foreign investors, labor unions that experience employment gains, and local communities that benefit from location of the MNC facility.<sup>15</sup> Grossman & Helpman (1996) refer to this distributive rationale in their analysis of trade policy in the presence of multinationals:

“When policy toward DFI is endogenous, the politics may generate a conflict between domestic firms wanting investment restrictions and domestic workers with industry-specific skills wanting free entry by multinationals.” (Grossman and Helpman, 1996, pp. 220.)

We explicitly model the distributive consequences of foreign investment as driving the preferences of domestic actors on the demand side of politics. We also map those

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<sup>13</sup>More recent models of partisan and electoral business cycles are: Alesina (1987, 1988), Alvarez, Garrett and Lange (1991), Alesina and Rosenthal (1995), Boix (1997, 1998), Garrett (1998), Iversen (1999), and Franzese (2002), among others. The existence of a partisan business cycle has received more support than its electoral counterpart. See Franzese (2003) for an excellent review of this literature.

<sup>14</sup>Bhagwati et al. 1992; Dinopoulos 1992; Grossman & Helpman 1996; Blonigen and Feenstra 1997.

<sup>15</sup>Bhagwati et al. 1992, p. 188.

preferences onto the partisan orientation of governments. We predict that left-leaning governments -those governments that cater to labor- are more likely to provide better investment conditions to lure foreign investment into those sectors where labor is a complement of FDI. Furthermore, we argue that the party representing domestic business interests will offer a more favorable investment environment to foreign investment of the type that is more likely to raise the return to domestic capital. At the same time, they will limit the inflow of foreign investment to those sectors where foreign investment is more likely to increase the demand for labor, and/or compete down the rents that would have otherwise accrued to domestic business owners, thus reducing the return they receive from their economic activity.<sup>16</sup> In a strategic environment foreign investors anticipate and react to governments' policies by investing with the "right" technology when the host government is of the "right" type.

Our emphasis on partisanship and the distributive consequences of FDI sets our research apart from the extant literature on the politics of FDI and MNCs activity. This literature overlooks the link between preferences and FDI activity, and focuses instead on the effects of political institutions (Oneal 1994; Li and Resnick 2003; Jensen 2003, 2006; among others) and on the effects of policy decisions -trade and tax policy in particular- on FDI flows (Feldstein, Hines, and Hubbard 1995; Hines 2001).<sup>17</sup> Most of these studies, implicitly or explicitly, assume that investors put emphasis on minimizing ex-post expropriation risk, and look at the role of policy and political stability on investment decisions: foreign investment would strategically flow to countries that look politically and institutionally stable, and with sound macro-economic management.<sup>18</sup> These are

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<sup>16</sup>Pro-business governments are more likely to encourage inflows of foreign capital that would benefit domestic capital, particularly investments that complement capital in production, introduce labor saving technologies, or bring in technological innovations that the local firms can benefit from. The regulation of FDI in South Korea through the late 1990s seems to support this argument: The Korean government limited the entry of foreign capital to hold a non-controlling stake in Korean corporations, and promoted technology licensing agreements to the *chaebols* (see Haggard 1990; Mardon 1990; Nicolas 2001, 2003; Pinto 2004; Sachwald 2003; and Yun 2003).

<sup>17</sup>Recent academic work has analyzed the effect of politics on investment decisions within an individual industry (see Levy and Spiller 1994, Henisz and Zelner 2001, Henisz 2002, among others). However, the analysis of this relationship over multiple sectors is an early stage (see Li & Mihalache 2006; Pinto & Pinto 2006).

<sup>18</sup>The role of inflexible policy is stressed in a recent body of literature in the transaction costs tradition (Williamson 1985; Henisz and Williamson 1999; Spiller and Tommasi 2003).

sensible explanations, yet they leave a large part of the variance in FDI performance unexplained.<sup>19</sup>

There is, however, a large literature on the behavior of MNCs and its effects on factor returns, employment, and forward and backward spill-overs in host countries.<sup>20</sup> More recently scholars have drawn on these likely consequences to analyze the desirability and cost effectiveness of offering concessions -in the form of tax breaks, subsidies, etc.- to lure foreign investment into a host country, practices that have been pervasively used in the developed and developing world alike. The tentative conclusion from these analyses is that these policies used to promote foreign investment are only likely raise aggregate welfare in the host country under very stringent conditions, which are systematically violated in practice. Among these conditions we find: local factors that the foreign investor intensively uses are elastic in supply, to reduce the effect on factor costs; firms that compete with the multinational for resources earn low or zero economic profits; and the MNC generates large positive productivity spillovers for domestic firms in competing and non-competing industries.<sup>21</sup> Using these conditions as a benchmark, Hanson (2001) finds that the concessions offered by local governments in Brazil to attract investment from General Motors and Ford in the 1990s may have lowered aggregate welfare in Brazil. There is a logic behind the granting these concessions:

“... attracting multinationals may benefit specific constituencies from whom politicians derive support...” (Hanson 2001, pp.23).

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<sup>19</sup>In a dynamic setting partisanship could play a role in reducing the expectation that the host government would act opportunistically against some types of investors, not others.

<sup>20</sup>Dunning 1989; Caves 1996; Haddad & Harrison 1993; Aitken et al. 1997; Borensztein et al. 1998; Aitken & Harrison 1999; Harrison & Lipsey 1996; Feliciano and Lipsey 1999; Tybout 2000; Hanson 2001; Conyon et. al 2002; Blomstrom & Kokko 2003. These classical studies suggest that affiliates of MNCs are more likely to be more productive and enjoy higher profitability than their counterparts in host countries; yet they have been criticized for failing to control for the significant difference between MNC affiliates and domestic firms at the firm, plant and industry level, and for simultaneity bias. After controlling for these effects, recent studies have found evidence that affiliates of MNCs in the United Kingdom indeed affect the return to labor: when compared to their domestic counterparts affiliates of foreign MNCs in the United Kingdom increase labor productivity by 13 percent, and pay higher wages to their employees (Conyon et al., 2002).

<sup>21</sup>See Hanson 2001, pp.18. Blomstrom & Kokko 2003 arrive to a similar conclusion: whether FDI has positive spillover effects on domestic firms depends on the absorptive capacity of the host economy.

The framework developed in the ensuing sections helps explain why those policies are adopted in the first place. We seek to understand the determinants of these partisan cycles in investment performance and their consequences on employment, profits and wages in the host country. In sections 3-5 we develop a model that captures the interaction between foreign investors, an incumbent government and economic agents in the host country. Specifically, the model assumes that inflows of direct investment could have a positive or negative effect on employment and on the returns to domestic factors of production, ie, foreign direct investment could either a complement or substitute those factors in production.<sup>22</sup> We also assume that host governments place different weights on the well-being of their core constituents, which for simplicity in the stylized model we label as owners of labor or capital. The weights placed on the well-being of labor or capital varies with the government's type, ie, pro-labor or pro-capital. The type and level of the endogenously determined investment inflows that result from this interaction is conditional on the incumbent's type. Moreover, the effects of investment inflows on wages and employment levels at the sectoral level depend on labor market institutions and unemployment benefits prevalent in the host country.

### 3 The Model

The setup of our model is as simple as possible. We consider a two-sector, small open economy. World prices in both sectors are normalized to one. The production function  $f^i(K^i, k^i, L^i)$  characterizes the technology used in sector  $i$ , for  $i = 1, 2$ . Three factors of production are required in the production process: domestic labor  $L^i$ , domestic capital  $K^i$ , and foreign capital  $k^i$ . Foreign capital is perfectly mobile across countries. It is available in infinite supply at price  $p$ . Domestic labor and domestic capital are internationally immobile and sector specific. The total endowment of each factor in each sector

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<sup>22</sup>The concept of complementarity and substitutability in production is consistent with the transaction costs explanations of the emergence and prevalence of multinational corporation, and its flip-side foreign investment (Caves 1996). The ratio of specific and proprietary assets, technology and know-how to capital is likely to vary across industries, firms and sectors of the economy. These differences could lead to different effects on the return to asset owners in the host country.

is given by  $\bar{L}^i$  and  $\bar{K}^i$ . While domestic capital is fully employed, i.e.,  $K^i = \bar{K}^i$ , part of the labor force qualified to work in sector  $i$  may be unemployed in equilibrium, as explained later. In other words,  $L^i \leq \bar{L}^i$ . The production function  $f^i(K^i, k^i, L^i)$  is monotonically increasing in all factors of production, i.e.,  $f_\nu^i > 0$  for  $\nu = K, k, L$ , and strictly concave in  $k^i$  and  $L^i$ , i.e.,  $f_{LL}^i < 0$ ,  $f_{kk}^i < 0$  and  $H^i = f_{kk}^i f_{LL}^i - (f_{Lk}^i)^2 > 0$ . Factors of production are paid their respective marginal products. The return to the fixed factor  $K^i$  is given by the profits that are left after deducting the remuneration to  $L^i$  and  $k^i$ .<sup>23</sup>

For the purpose of the present analysis, we consider two domestic actors or political groups: domestic workers, denoted with a  $\mathcal{L}$ , and domestic capitalists, denoted with a  $\mathcal{K}$ . The utility of domestic workers in sector  $i$ ,  $u^i(w^i, L^i)$ , depends on the level of wages and the level of employment in that sector. Domestic capitalists derive utility directly from income. Their only source of income is given by the rent they receive from being engaged in the production process.

The host government can impose a tax on foreign capital. This is the only policy instrument the government can rely on to discourage the entry of foreign capital into different sectors of the economy. The tax revenue is used to finance a system of transfers, denoted  $b^i$ , targeted to unemployed workers in each sector. We assume that the government can impose different tax rates on foreign capital across sectors. Let  $t^i$  be the capital tax rate in sector  $i$ . The allocation of foreign capital is determined by  $f_k^i - t^i = r$  or  $f_k^i = r^i$ , where  $r^i = r + t^i$ . As a result, domestic capital in sector  $i$  receives

$$\tilde{\pi}^i = f^i(\bar{K}^i, k^i, L^i) - w^i L^i - r^i k^i. \quad (1)$$

The model assumes that wages and employment level are determined through a process of sequential bargaining between labor and the firm. The bargaining process is

<sup>23</sup>As usual, subindexes denote partial derivatives. Alternatively, it can be assumed that the production function  $f^i(K^i, k^i, L^i)$  exhibits constant returns to scale, so once factors are paid their marginal products profits are zero. Income received by domestic capitalists is  $\bar{K}^i$  times the marginal productivity of  $K^i$ , which is equal to  $\tilde{\pi}^i$ . We follow this last approach in the numerical example we construct later.

specific to the sector. The timing of the game is as follows: (1) the government determines the levels of  $t^i$  and  $b^i$ ; (2) labor (the union) observes  $t^i$  and  $b^i$  and makes a wage demand  $w^i$ ; (3) the firm observes the policy variables and the wage demand  $w^i$ , accepts  $w^i$ , and chooses employment  $L^i$  and the amount of foreign capital  $k^i$ ; finally, (4) payoffs  $u^i$  and  $\tilde{\pi}^i$  are realized. As usual the game is solved by backward induction.

The wage bargaining problem in the presence of mobile foreign capital, which corresponds to stages (2) and (3) of the game, is analyzed in the next section. The government's problem, stage (1), is considered in Section 5.

## 4 Wage Bargaining with Mobile Foreign Capital

### 4.1 Third stage

In the third stage of the game, the demands for  $k^i$  and  $L^i$  are established in the following way:

$$f_k^i - r^i = 0, \quad (2)$$

$$f_L^i - w^i = 0. \quad (3)$$

These two equations implicitly define  $k^i(\bar{K}^i, t^i, w^i)$  and  $L^i(\bar{K}^i, t^i, w^i)$ . For future reference, we derive the following comparative static results:

$$\frac{\partial k^i}{\partial t^i} = \frac{\partial k^i}{\partial r^i} = \frac{f_{LL}^i}{H^i} < 0, \quad \frac{\partial L^i}{\partial w^i} = \frac{f_{kk}^i}{H^i} < 0, \quad \text{and} \quad \frac{\partial k^i}{\partial w^i} = \frac{\partial L^i}{\partial r^i} = \frac{\partial L^i}{\partial t^i} = -\frac{f_{Lk}^i}{H^i}, \quad (4)$$

where  $H^i > 0$ . These results indicate that  $k^i$  declines with  $t^i$ ,  $L^i$  declines with  $w^i$ , and the signs of the cross derivatives  $\partial k^i/\partial w^i$  and  $\partial L^i/\partial t^i$  depend on the technological relationship between  $k^i$  and  $L^i$ . Henceforth, we consider that  $k^i$  and  $L^i$  are complements in production when  $f_{kL}^i > 0$ , which means that  $\partial k^i/\partial w^i < 0$  and  $\partial L^i/\partial t^i < 0$ , and they are substitutes when  $f_{kL}^i < 0$ , so that  $\partial k^i/\partial w^i > 0$  and  $\partial L^i/\partial t^i > 0$ .

## 4.2 Second stage

At the second stage of the game, the wage is chosen anticipating that the firm will decide the amount of employment according to the previously derived labor demand function. The wage is determined by maximizing the utility of labor, represented by the function  $u^i(w^i, L^i)$ , subject to  $L^i(\bar{K}^i, t^i, w^i)$ . In particular, we assume that  $u^i(w^i, L^i)$  is given by the sum of the income received by the employed workforce and the government assistance paid to unemployed workers in the sector. Thus, under these specific assumptions, the level of  $w^i$  solves the following problem:

$$\max_{\{w^i\}} u^i(w^i, L^i) = w^i L^i + b^i(\bar{L}^i - L^i), \quad (5)$$

subject to the labor demand  $L^i(\bar{K}^i, t^i, w^i)$ , where  $b^i$  is the level of unemployment benefits for workers in sector  $i$ .<sup>24</sup> If all workers in the sector face the same probability of becoming unemployed and normalizing  $\bar{L}^i = 1$ , the objective function of this problem is equivalent to the expected income of all workers in the sector.

The first-order condition for an interior solution gives<sup>25</sup>

$$L^i + (w^i - b^i) \frac{\partial L^i}{\partial w^i} = 0. \quad (6)$$

Equation (6) implicitly defines  $w^i(\bar{K}^i, t^i, b^i)$ . Note that since  $\partial L^i / \partial w^i < 0$ , at an interior solution  $w^i > b^i$ . Let  $\varepsilon_{Lw} \equiv (\partial L^i / \partial w^i)(w^i / L^i)$  denote the elasticity of labor demand with respect to wages. Then, (6) can be written as:

$$1 + \frac{(w^i - b^i)}{w^i} \varepsilon_{Lw}^i = 0 \Rightarrow |\varepsilon_{Lw}^i| > 1. \quad (7)$$

Notice that  $w^i L^i$  would be maximized when  $|\varepsilon_{Lw}^i| = 1$ . In equilibrium, the wage rate is

<sup>24</sup>In our setup, we allow unemployment benefits to differ by sector.

<sup>25</sup>The second-order condition establishes that

$$D^i = 2 \frac{\partial L^i}{\partial w^i} + (w^i - b^i) \frac{\partial^2 L^i}{(\partial w^i)^2} < 0.$$

chosen so that  $|\varepsilon_{Lw}| > 1$ , which implies that  $w^i$  is higher than the one that maximizes  $w^i L^i$ , as long as  $b^i > 0$ .

Next, we examine the effect  $t^i$  on  $w^i$ ,  $L^i$ , and  $k^i$ . By implicit differentiation of (6), the following comparative static result can be obtained:

$$\frac{\partial w^i}{\partial t^i} = -\frac{\partial L^i / \partial t^i + (w^i - b^i)(\partial^2 L^i / \partial w^i \partial t^i)}{D^i}. \quad (8)$$

The effect of  $t^i$  on  $w^i$  cannot be unambiguously determined without establishing additional conditions on the production function. In section 4.3 we will introduce a specific functional form and examine this derivative closely.

A change in  $t^i$  affects  $L^i$  and  $k^i$  both directly and indirectly, through  $w^i$ . Recall that  $L^i(K^i, t^i, w^i)$  and  $k^i(K^i, t^i, w^i)$ , where  $w^i(K^i, t^i, b^i)$ . Thus, the total effect of  $t^i$  is

$$\frac{dL^i}{dt^i} = \frac{\partial L^i}{\partial t^i} + \frac{\partial L^i}{\partial w^i} \frac{\partial w^i}{\partial t^i}, \quad (9)$$

$$\frac{dk^i}{dt^i} = \frac{\partial k^i}{\partial t^i} + \frac{\partial k^i}{\partial w^i} \frac{\partial w^i}{\partial t^i}. \quad (10)$$

Notice that, even when the sign of  $\partial w^i / \partial t^i$  is known, it may not be possible to sign the expressions (9) or (10).

The effect of  $b^i$  on the previous variables will also become relevant in the next stage when the government decides the level of the policy variables. Again, by implicitly differentiating equation (6) with respect to  $b^i$ , we obtain

$$\frac{\partial w^i}{\partial b^i} = \frac{\partial L^i / \partial w^i}{D^i} > 0. \quad (11)$$

A higher level of unemployment benefits increases the equilibrium wage rate in the sector.

Notice that  $b^i$  affects  $L^i$  and  $k^i$  only indirectly, i.e., through its effect on wages. Thus,

$$\frac{dL^i}{db^i} = \frac{\partial L^i}{\partial w^i} \frac{\partial w^i}{\partial b^i} < 0, \quad (12)$$

$$\frac{dk^i}{db^i} = \frac{\partial k^i}{\partial w^i} \frac{\partial w^i}{\partial b^i}. \quad (13)$$

The effect of  $b^i$  on  $w^i$ ,  $L^i$ , and  $k^i$  can be summarized in the following way. As  $b^i$  rises, the pool of unemployed workers gets larger reducing labor supply and, consequently, increasing wages. This higher level of wages ultimately increases the demand for foreign capital when  $k^i$  and  $L^i$  are substitutes, and decreases  $k^i$  when they are complements.

Considering the previous results, it is possible to examine the impact of  $t^i$  and  $b^i$  on the utility of labor and on the return to domestic capital. By the envelope theorem,

$$\frac{\partial u^i}{\partial t^i} = (w^i - b^i) \frac{\partial L^i}{\partial t^i}, \quad (14)$$

$$\frac{\partial u^i}{\partial b^i} = \bar{L}^i - L^i > 0. \quad (15)$$

If  $L^i$  and  $k^i$  are substitutes in the sense that  $f_{Lk}^i < 0$ , then  $\partial L^i / \partial t^i$  is positive, which means that  $u^i$  increases with higher values of  $t^i$ . The inverse is true when  $L^i$  and  $k^i$  are complements. Higher values of  $b^i$ , on the other hand, always increase  $u^i$ . Additionally,

$$\frac{\partial \tilde{\pi}^i}{\partial t^i} = - \left( \frac{\partial w^i}{\partial t^i} L^i + k^i \right), \quad (16)$$

$$\frac{\partial \tilde{\pi}^i}{\partial b^i} = - \frac{\partial w^i}{\partial b^i} L^i < 0. \quad (17)$$

The sign of  $\partial \tilde{\pi}^i / \partial t^i$  is ambiguous. However,  $\tilde{\pi}^i$  always declines with  $b^i$ .

This section allows us to establish the following remarks. First, partisan governments responding to the interests of labor would tend to choose tax rates on foreign capital that are relatively low when  $L^i$  and  $k^i$  are complements, and values of  $t^i$  that are relatively high when they are substitutes, as expected.<sup>26</sup> However, the resulting out-

<sup>26</sup>Note that we do not claim that the government will choose extreme values of  $t^i$  such as  $t^i = 0$  or  $t^i = 1$ . Tax rates also affect the tax revenue, which eventually finances unemployment benefits. Hence, this effect should also be taken into

comes, characterized by different combinations of wages ( $w^i$ ) and employment ( $L^i$ ) may vary significantly. Depending on the signs of  $\partial w^i/\partial t^i$  and  $\partial L^i/\partial t^i$ , higher levels of wages may be observed with either higher or lower levels of employment. Alternatively, higher levels of employment may be combined with higher or lower levels of wages. Second, a pro-labor government would choose relatively high values of  $b^i$ , even though this would tend to reduce the level of employment  $L^i$ . Finally, a government responding to the interests of domestic capitalists may choose either high or low tax rates on foreign capital. Both possibilities are consistent with equation (16). These types of governments, however, will unambiguously prefer lower levels of  $b^i$ .

Before continuing with the first stage of the game, we consider a specific production function in order to derive additional results.

### 4.3 Numerical Example

Suppose that the technology is represented by the following CES function:<sup>27</sup>

$$q = f(K, k, L) = AK^{1-\beta} (L^\rho + ak^\rho)^{\beta/\rho}, \quad (18)$$

with  $\beta \in (0, 1)$ ,  $\rho \in (-\infty, 1)$ , and  $a > 0$ . The production function has the 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  $(L^\rho + ak^\rho)^{1/\rho}$ . The function allows for different substitution possibilities between  $L$  and  $k$ , depending on the value of  $\rho$ . In fact, the elasticity of substitution between these two factors  $\sigma_{Lk}$  is  $1/(1 - \rho)$ .<sup>28</sup>

In the previous section, we define complementarity and substitutability between

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account when deciding the level of  $t^i$ .

<sup>27</sup>All variables and parameters are sector specific. However, supraindexes have been suppressed for the moment.

<sup>28</sup>Different values of  $\rho$  also indirectly affect the elasticities of substitution between domestic capital and labor and domestic capital and foreign capital. These elasticities are not constant and they are given, respectively, by

$$\sigma_{LK} = \frac{(1 - \beta)L^\rho + ak^\rho}{(1 - \beta)L^\rho(1 - \rho) + ak^\rho}, \quad \sigma_{kK} = \frac{L^\rho + (1 - \beta)ak^\rho}{L^\rho + (1 - \beta)ak^\rho(1 - \rho)}. \quad (19)$$

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 (18), the following relationship between  $\beta$ ,  $\rho$  and  $f_{Lk}$  holds:

$$f_{Lk} = \frac{(\beta - \rho) f_L f_k}{\beta q}. \quad (20)$$

Thus, when  $\beta > \rho$ , then  $L$  and  $k$  are necessarily complements, while when  $\beta < \rho$ , they are substitutes.<sup>29</sup>

In this case, the demands for  $L$  and  $k$  are respectively given by

$$L = \Delta (aw)^{-1/(1-\rho)} \quad (21)$$

$$k = \Delta r^{-1/(1-\rho)} \quad (22)$$

where  $\Delta = K(A\beta a)^{1/(1-\beta)} [(aw)^{\rho/(1-\rho)} + ar^{\rho/(1-\rho)}]^{(\beta-\rho)/\rho(1-\beta)} > 0$ . By differentiating (21) with respect to  $w$  and  $t$  (or, equivalently, with respect to  $r$ ), we obtain

$$\frac{\partial L}{\partial w} = - \left[ \frac{\eta}{(1-\beta)} + \frac{(1-\eta)}{(1-\rho)} \right] \frac{L}{w} = \varepsilon_{Lw} \frac{L}{w}, \quad (23)$$

$$\frac{\partial L}{\partial t} = - \left[ \frac{(\beta-\rho)(1-\eta)}{(1-\beta)(1-\rho)} \right] \frac{L}{r} = \varepsilon_{Lr} \frac{L}{r}, \quad (24)$$

where  $\varepsilon_{Lj}$  is the elasticity of labor demand with respect to  $j = w, r$ . As established in (4), the sign of  $\partial L/\partial t$  depends on  $f_{Lk}$ . In this case, the latter is determined by  $(\beta - \rho)$  (according to (20)).

We can also derive the sign of  $\partial w/\partial t$  under the present assumptions. Equation (8) can be rewritten as

$$\frac{\partial w}{\partial t} = - \frac{1}{D} \frac{\partial L}{\partial t} \left[ 1 - \frac{L(\partial^2 L/\partial w \partial t)}{(\partial L/\partial t)(\partial L/\partial w)} \right]. \quad (25)$$

<sup>29</sup>The production function specified in (18) also implicitly assumes that domestic capital is necessarily a complement of labor and of foreign investment, in the sense that  $f_{LK}$  and  $f_{kK}$  are both always positive.

As a result, expression (25) becomes

$$\frac{\partial w}{\partial t} = -\frac{1}{D} \frac{\partial L}{\partial t} \left[ \frac{\rho(1-\beta)\delta}{(1-\rho)} \right]. \quad (26)$$

where

$$0 < \delta = \frac{(1-\rho)(aw)^{\rho/(1-\rho)}}{(1-\rho)(aw)^{\rho/(1-\rho)} + (1-\beta)r^{\rho/(1-\rho)}} < 1.$$

Suppose that  $(\beta - \rho) < 0$ , so that  $L$  and  $k$  are substitutes and  $\partial L/\partial t > 0$ . Given that  $D < 0$ , then  $\partial w/\partial t > 0$ . Suppose that  $(\beta - \rho) > 0$ ,  $L$  and  $k$  are complements, and  $\partial L/\partial t < 0$ . In light of (26), we consider two sub-cases: (i)  $0 < \rho < \beta$ , and (ii)  $\rho < 0$ . In sub-case (i),  $\partial w/\partial t < 0$ , which means that wages decline with higher levels of tax rates. On the other hand, in sub-case (ii), even though  $\partial L/\partial t$  is still negative,  $\partial w/\partial t$  becomes positive because  $\rho$  is negative.

Next, by inspecting equation (9), we can examine the total effect of  $t$  on  $L$  under different technological relationships between  $L$  and  $k$ . Suppose that these factors of production are substitutes. Since  $\partial L/\partial t > 0$  the first term in (9) is positive. The second term, which is the product of  $\partial L/\partial w$  and  $\partial w/\partial t$ , is negative. The final effect depends on the relative magnitudes of the two terms. As a consequence, this result states that higher levels of  $t$  are consistent with both higher or lower employment levels when  $L$  and  $k$  are substitutes.

Consider the two cases of complementarity between  $L$  and  $k$  examined before. Suppose that  $0 < \rho < \beta$ . Then,  $\partial L/\partial t < 0$  and  $\partial w/\partial t < 0$ . The first term in (9) is negative and the second term is positive, so again the final impact of  $t$  on  $L$  depends on the relative magnitudes of the two terms. Finally, suppose that  $\rho < 0$ . Given that in this case  $\partial w/\partial t > 0$ , then both terms of (9) are negative, which means that  $dL/dt < 0$ . Similar conclusions apply for  $dk/db$ .

Once the sign of  $\partial w/\partial t$  is known, we can study the effect of  $t$  on  $\tilde{\pi}$ . By examining

expression (16), it becomes clear that if  $L$  and  $k$  are substitutes, so that  $\partial w/\partial t > 0$  is positive, the return to the fixed factor declines with higher levels of  $t$ , i.e.,  $\partial \tilde{\pi}/\partial t < 0$ . The same situation arises when labor ( $L$ ) and foreign capital ( $k$ ) are complements and  $\rho < 0$ . In order for  $\tilde{\pi}$  to increase as  $t$  rises, the factors of production  $L$  and  $k$  must be complementary in production and  $0 < \rho < \beta$ , so that  $\partial w/\partial t < 0$ , and, in addition,  $|\partial w/\partial t|L > k$ .

The table below summarizes the results obtained thus far.

	Substitutes	Complements	
	$\beta < \rho < 1$	$0 < \rho < \beta$	$\rho < 0$
$\partial L/\partial t$	(+)	(-)	(-)
$\partial w/\partial t$	(+)	(-)	(+)
$dL/dt$	(+), (-), or 0	(+), (-), or 0	(-)
$dk/dt$	(+), (-), or 0	(+), (-), or 0	(-)
$\partial \tilde{\pi}/\partial t$	(-)	(+), (-), or 0	(-)
$\partial u/\partial t$	(+)	(-)	(-)
$\partial w/\partial b$	(+)	(+)	(+)
$dL/db$	(-)	(-)	(-)
$dk/db$	(+)	(-)	(-)
$\partial \tilde{\pi}/\partial b$	(-)	(-)	(-)
$\partial u/\partial b$	(+)	(+)	(+)

A number of observations follow from the table. First, consider a partisan government that weighs more heavily the utility of owners of labor. This *pro – labor* government would tend to choose higher tax rates when  $L$  and  $k$  are substitutes and lower tax rates when they are complements. When foreign capital is a substitute of labor, the outcome is characterized by a high level of wages and is consistent with either lower or higher levels of employment. When foreign capital and labor are complements, on the other hand, inflows of foreign capital could lead to lower wages, when  $0 < \rho < \beta$ , or higher

wages, when  $\rho < 0$ . The former case can be accompanied by either higher or lower levels of employment of  $L$ , while the latter is unambiguously characterized by low values of  $L$ . Second, a pro-capital government, ie, partisan government responding to the interests of domestic capitalists, would tend to choose lower tax rates when  $L$  and  $k$  are substitutes, or when  $L$  and  $k$  are complements and  $\rho < 0$ . However, higher levels of  $t$  could be preferred when labor and foreign capital are complements and  $0 < \rho < \beta$ . This last situation is consistent with  $|\partial w/\partial t|L > k$ , which would imply that  $\partial \tilde{\pi}/\partial t < 0$ . Finally, labor and domestic capitalists' interests would be completely aligned when  $L$  and  $k$  are complements and  $\rho < 0$ , and there would be complete disagreement when  $L$  and  $k$  are substitutes, where labor would be in favor of imposing higher levels of  $t$ , while domestic capitalists would prefer lower taxes on  $k$ .

In order to illustrate some of the previous results, we construct several numerical examples. The goal is to examine how the relevant endogenous variables change with  $t$  for different values of  $b$ . Each case assumes different technological relationships between  $k$  and  $L$ . We begin by examining a situation where  $k$  and  $L$  are substitutes (Figure 1).<sup>30</sup> Two observations are worth emphasizing. First, notice that labor unambiguously prefer higher levels of unemployment benefits even though this implies lower levels of employment. The reason is that this last effect will be more than compensated by the resulting higher wages and higher utility of the unemployed workforce. Second, employment first increases with  $t$ , reaches a maximum at around  $t = 0.05$ , and then declines with  $t$ . In this case, the first term in (9) dominates for low values of  $t$ , while the second term dominates for higher values of  $t$ .

Next, we assume that  $k$  and  $L$  are complements in production and distinguish between: (i)  $0 < \rho < \beta$  (Figure 2);<sup>31</sup> and (ii)  $\beta < \rho < 1$  (Figure 3).<sup>32</sup> The two cases are very similar in terms of the response of the variables to changes in the tax rate. The

<sup>30</sup>The parameter values used in this case are  $r = 0.10, A = 0.20, a = 1, K = 1, \beta = 0.60, \rho = 0.75$ .

<sup>31</sup>The parameter values are  $r = 0.10, A = 0.20, a = 1, K = 1, \beta = 0.60, \rho = 0.55$ .

<sup>32</sup>The parameter values are  $r = 0.10, A = 0.70, a = 1, K = 1, \beta = 0.60, \rho = -1.00$ .

only exception, however, is that in case (i) wages decline with  $t$ , while in case (ii) wages increase with  $t$ . Additionally, notice that both  $dL/dt$  and  $\partial\tilde{\pi}/\partial t$  are negative in both cases. Recall, however, that in general the signs of these expressions are ambiguous.

## 5 Government's Problem

### 5.1 First stage: governments choose tax rates

At this stage, governments, characterized by different political orientations (defined as pro-labor or pro-capital), decide the levels of the policy variables. In this section, we only focus on the government's choice of tax rates  $t^i$ , for given values of  $b^i$ ,  $i = 1, 2$ . In the next section, we examine the solution when governments are allowed to choose both  $t^i$  and  $b^i$ . In particular, we assume that tax rates should be such that the tax revenue  $T = t^1k^1 + t^2k^2$  meets an exogenously given level  $\bar{T}$ , i.e.,  $t^1k^1 + t^2k^2 = \bar{T}$ . Under these conditions, governments choose tax rates so as to redistribute income towards a given political group. At the same time, however, the levels of  $t^i$  should allow them to collect  $\bar{T}$  at the lowest "efficiency cost".

The government's political orientation is determined by the objective function it chooses to maximize. We assume that the latter is a weighted sum of the aggregate welfare of workers and capitalists, where  $\Theta_{\mathcal{L}}$  is the weight attached to workers and  $\Theta_{\mathcal{K}} = (1 - \Theta_{\mathcal{L}})$  to domestic capitalists. Governments with  $\Theta_{\mathcal{L}} > 1/2$  have a pro-labor orientation, and those with  $\Theta_{\mathcal{L}} < 1/2$  primarily respond to the interests of capitalists. Specifically, the government's problem consists of:

$$\max_{\{t^1, t^2\}} \Omega = \Theta_{\mathcal{L}}(\bar{L}^1 u^1 + \bar{L}^2 u^2) + \Theta_{\mathcal{K}}(\bar{K}^1 \tilde{\pi}^1 + \bar{K}^2 \tilde{\pi}^2) \quad (27)$$

subject to  $t^1 k^1 + t^2 k^2 = \bar{T}$ . The first-order conditions are

$$t^i : \Theta_{\mathcal{L}}(w^i - b^i) \frac{\partial L^i}{\partial t^i} - \Theta_{\mathcal{K}} \left( \frac{\partial w^i}{\partial t^i} L^i + k^i \right) + \lambda \left( k^i + t^i \frac{dk^i}{dt^i} \right) = 0, \quad i = 1, 2 \quad (28)$$

$$\lambda : t^1 k^1 + t^2 k^2 - \bar{T} = 0, \quad (29)$$

where  $\lambda$  is the Lagrange multiplier associated with the government's budget constraint. The system of equations (28) and (29) determines the values of  $t^i$  as a function of the exogenous parameters.

Equation (28) can also be written as

$$-\theta_{\mathcal{L}} \left[ \frac{(w^i - b^i)(\partial L^i / \partial t^i)}{k^i} \right] + \theta_{\mathcal{K}} \left[ \frac{(\partial w^i / \partial t^i) L^i + k^i}{k^i} \right] = \frac{(\partial T / \partial t^i)}{k^i}, \quad i = 1, 2, \quad (30)$$

where

$$\frac{\partial T}{\partial t^i} = k^i + t^i \frac{dk^i}{dt^i}. \quad (31)$$

Note that  $\theta_{\mathcal{L}} = \Theta_{\mathcal{L}}/\lambda$  and  $\theta_{\mathcal{K}} = \Theta_{\mathcal{K}}/\lambda$  are the government's valuation of a change in workers and capitalists income, respectively (expressed in terms of government revenue). They measure the governments marginal benefit of transferring one dollar to household  $h = \mathcal{L}, \mathcal{K}$ . The expressions between square brackets on the left-hand side of (30) show the proportional change in income for group  $h$  when  $t^i$  is modified. The right-hand side of (30) captures the effect of  $t^i$  on the tax revenue, also as a proportion of  $k^i$ .

By examining equation (30) it is possible to understand why certain sectors will end up receiving larger amounts of foreign capital relative to others. A partisan government chooses the levels of  $t^i$  so as to manipulate the allocation of foreign capital across sectors, with the objective of benefiting the political group they represent. Consider a pro-labor government, i.e., one with relatively high values of  $\Theta_{\mathcal{L}}$  and, consequently, high values of  $\theta_{\mathcal{L}}$ . Suppose that  $k$  and  $L$  are substitutes in sector 1 and complements in sector 2. Under these conditions, the left-hand side of (30) would tend to be smaller for sector

1 relative to sector 2. Hence,  $\partial T/\partial t^1 < \partial T/\partial t^2$ . If, additionally, the tax revenue curve is concave in  $t^i$ , then  $t^1$  would be higher than  $t^2$ . Similar results would follow factors were substitutes in both sectors, but the degree of substitutability is smaller in sector 2. The inverse would be true when  $k$  and  $L$  are complements in both sectors. In this case, the allocation of foreign capital would be biased towards the sector where the degree of complementarity is highest. The level of  $t^i$  would be lower in this sector.

## 5.2 First stage: governments decide the levels of tax rates and unemployment benefits

Now, we allow partisan governments to decide the levels of both  $t^i$  and  $b^i$  for  $i = 1, 2$ . These values are the ones that maximize the objective function (32), subject to the constraint that the tax revenue  $T = t^1 k^1 + t^2 k^2$  finances unemployment benefits  $B = (\bar{L}^1 - L^1)b^1 + (\bar{L}^2 - L^2)b^2$ . Thus, different levels of redistribution across political groups can be achieved with different combinations of  $\{t^i, b^i\}, i = 1, 2$ . The government's problem in this case becomes:

$$\max_{\{t^1, t^2, b^1, b^2\}} \Omega = \Theta_{\mathcal{L}}(\bar{L}^1 u^1 + \bar{L}^2 u^2) + \Theta_{\mathcal{K}}(K^1 \tilde{\pi}^1 + K^2 \tilde{\pi}^2) \quad (32)$$

subject to  $t^1 k^1 + t^2 k^2 = (\bar{L}^1 - L^1)b^1 + (\bar{L}^2 - L^2)b^2$ . As a result, the first-order conditions are:

$$t^i : \Theta_{\mathcal{L}}(w^i - b^i) \frac{\partial L^i}{\partial t^i} - \Theta_{\mathcal{K}} \left( \frac{\partial w^i}{\partial t^i} L^i + k^i \right) + \lambda \left( k^i + t^i \frac{dk^i}{dt^i} + b^i \frac{dL^i}{dt^i} \right) = 0, \quad (33)$$

$$b^i : \Theta_{\mathcal{L}}(\bar{L}^i - L^i) - \Theta_{\mathcal{K}} \frac{\partial w^i}{\partial b^i} L^i + \lambda \left[ t^i \frac{dk^i}{db^i} + \frac{dL^i}{db^i} b^i - (\bar{L}^i - L^i) \right] = 0, \quad (34)$$

$$\lambda : t^1 k^1 + t^2 k^2 - (\bar{L}^1 - L^1)b^1 - (\bar{L}^2 - L^2)b^2 = 0, \quad (35)$$

for  $i = 1, 2$ . Following the same approach as in the last section, equation (33) can also be written as

$$-\theta_{\mathcal{L}} \left[ \frac{(w^i - b^i)(\partial L^i / \partial t^i)}{k^i} \right] + \theta_{\mathcal{K}} \left[ \frac{(\partial w^i / \partial t^i)L^i + k^i}{k^i} \right] = \frac{(\partial T / \partial t^i) - (\partial B / \partial t^i)}{k^i}, \quad (36)$$

The left-hand side is the same as (30). Consider the right-hand side of (36). The expression  $\partial T / \partial t^i$  was defined before. Additionally, given that a change in  $t^i$  also affects the level of employment  $L^i$ , the amount of government assistance in terms of unemployment benefits changes as well. The latter is represented by  $\partial B / \partial t^i = b^i(dL^i / dt^i)$ .

We can rewrite (34) as

$$\theta_{\mathcal{L}} - \theta_{\mathcal{K}} \left[ \frac{\partial w^i}{\partial b^i} \frac{L^i}{(\bar{L}^i - L^i)} \right] = \frac{(\partial B / \partial b^i) - (\partial T / \partial b^i)}{(\bar{L}^i - L^i)}, \quad (37)$$

where

$$\frac{\partial T}{\partial b^i} = t^i \frac{dk^i}{db^i}, \quad (38)$$

$$\frac{\partial B}{\partial b^i} = (\bar{L}^i - L^i) - b^i \frac{dL^i}{db^i} > 0. \quad (39)$$

Recall that  $\partial w^i / \partial b^i > 0$  for all possible technical relationship between inputs and  $dk^i / db^i > 0$  when  $L^i$  and  $k^i$  are substitutes, while  $dk^i / db^i < 0$  when they are complements. As in section 5.1, the incumbent will choose the levels of  $t^i$  so as to manipulate the allocation of foreign capital across sectors, with the objective of benefiting the political group they represent. Yet, in this case the pro-labor government would always prefer setting unemployment benefits to the highest level attainable given the elasticity of foreign investment to the mix of taxes and benefits chosen.

**[Note: The discussion in this section is preliminary and incomplete.]**

## 6 Conclusions

In this paper we develop a simple model that allows us to study the effect of FDI on wages and employment in the host country. Ultimately, the final impact depends on the technological relationship between factors of production. Given that partisan governments anticipate the effect of these flows on domestic political groups, they will decide, in each case, to deter or encourage the entry of foreign capital into certain production sectors.

Specifically, the following conclusions can be derived from our model. First, pro-labor governments will tend to choose tax rates on foreign capital that are relatively low when domestic labor and foreign capital are complements. The inverse will be true when they are substitutes. Second, the resulting outcomes in terms of the combination of wages and employment levels observed in each case, may be quite different, though. Again, the technological relationship between labor and foreign capital plays an important role. For instance, when pro-labor governments are in power, higher wages will be unambiguously observed in sectors where the factors of production are substitutes. However, both high and low levels of employment may be observed in this case. Our model also predicts that wages will be unambiguously high in sectors where the factors are complements if pro-labor governments are in power. The outcome can be accompanied in this case by both high or low levels of employment. The latter depends on the degree of complementarity. Third, a left-leaning government will always choose relatively high values of unemployment benefits even though this will tend to reduce the level of employment. Fourth, a government responding to the interests of domestic capitalists will not always favor the entry of foreign capital. Pro-domestic business governments, however, will unambiguously prefer lower levels of unemployment benefits. Finally, the model claims that under no conditions will higher restrictions to foreign investment will be unanimously supported by both domestic workers and domestic capitalists.

In future research we would like to explore the empirical implications of the predictions from this model by looking at the effect of the interaction between labor market institutions and government partisanship on the politics of foreign investment regulation and performance.

## References

- Aitken, Brian J. and Ann E. Harrison. 1999. Do Domestic Firms Benefit from Direct Foreign Investment? Evidence from Venezuela. *American Economic Review*, Vol. 89, No. 3, June 1999, pp. 605-618.
- Aitken, Brian, Ann Harrison, and Robert E. Lipsey. 1996. Wages and foreign ownership: A comparative study of Mexico, Venezuela, and the United States. *Journal of International Economics*, Volume 40, Issues 3-4, May 1996, pp. 345-371
- Alesina, Alberto. 1987. Macroeconomic Policy in a Two-Party System as a Repeated Game. *The Quarterly Journal of Economics* 102 (3): 651 - 678.
- Alesina, Alberto. 1988. Macroeconomics and politics. *National Bureau of Economic Research Macroeconomics Annual* 3: 13 - 36.
- Alesina, Alberto, and Howard Rosenthal. 1995. Partisan politics, divided government, and the economy, Political economy of institutions and decisions. New York, NY: Cambridge University Press.
- Alvarez, R. M., Geoffrey Garrett, and Peter Lange. 1991. Government Partisanship, Labor Organization, and Macroeconomic Performance. *American Political Science Review* 85 (2): 539 - 556.
- Azpiazu, Daniel, and Eduardo M. Basualdo. 1989. Cara y contracara de los grupos economicos: estado y promoci6n industrial en la Argentina. San Martn, Buenos Aires: Cntaro Editores.
- Beck, Nathaniel, Jonathan N. Katz, R. M. Alvarez, Geoffrey Garrett, and Peter Lange. 1993. Government Partisanship, Labor Organization, and Macroeconomic Performance - a Corrigendum. *American Political Science Review* 87 (4): 945 - 954.
- Bhagwati, Jagdish N., Elias Dinopoulos, and Kar-yu Wong. 1992. Quid Pro Quo Foreign Investment. *The American Economic Review*, Vol. 82, No. 2, *Papers and Proceedings of the Hundred and Fourth Annual Meeting of the American Economic Association* (May, 1992), pp. 186-190.
- Bhagwati, Jagdish N., Richard A. Brecher , Elias Dinopoulos, and T. N. Srinivasan. 1987. Quid pro quo foreign investment and welfare. A political-economy-theoretic model. *Journal of Development Economics*, Volume 27, Issues 1-2, October 1987, pp. 127-138.
- Blonigen, Bruce and Robert C. Feenstra, 1997, Protectionist Threats and Foreign Direct Investment, in Robert C. Feenstra, ed. *The Effects of U.S. Trade Protection and Promotion Policies*. Chicago, IL: Univ. of Chicago Press, 55-80.
- Blonigen, Bruce A., and David N. Figlio. 1998. Voting for Protection: Does Direct Foreign Investment Influence Legislator Behavior? *The American Economic Review*,

- Vol. 88, No. 4. (Sep., 1998), pp. 1002-1014.
- Boix, Carles. 1998. Political parties, growth and equality: conservative and social democratic economic strategies in the world economy. *Cambridge studies in comparative politics*. New York, NY: Cambridge University Press.
- Boix, Carles. 2003. Democracy and redistribution, *Cambridge studies in comparative politics*. New York, NY: Cambridge University Press.
- Brown, Drusilla K., Alan V. Deardorff, Robert M. Stern. 2003. The Effects of Multinational Production on Wages and Working Conditions in Developing Countries. *NBER Working Paper* no. 9669.
- Calvo, Guillermo A. 1978. On the Time Consistency of Optimal Policy in a Monetary Economy. *Econometrica: Journal of the Econometric Society* 46 (6): 1411 - 1428.
- Caves, Richard E. 1996. Multinational enterprise and economic analysis. Second Edition. New York, NY: Cambridge University Press.
- Ciccone, A., and G. Peri. 2003. Technological Progress and Skills' Substitutability: U.S. States 1950-1990. *CESifo Working Paper Series*, CESifo Working Paper No. 1024.
- Conyon, M. J., S. Girma, S. Thompson, and P. W. Wright. 2002. The productivity and wage effects of foreign acquisition in the United Kingdom. *Journal of Industrial Economics*, Vol. 50 (1): 85-102.
- Cox, Gary W., and Mathew D. McCubbins. 1993. Legislative Leviathan: Party Government in the House. *California Series on social choice and political economy* 23. Berkeley: University of California Press.
- Dinopoulos, E.. 1992. Quid Pro Quo Foreign Investment and VERS: A Nash Bargaining Approach. *Economics and Politics*, Vol. 4, No. 1 (March 1992), pp. 43-60.
- Drazen, Allan. 2000. Political economy in macroeconomics: Princeton: Princeton University Press.
- Dunning, J. H.. 1989. International Production and Multinational Enterprise. New York: Allen and Unwin.
- Dutt, Pushan, and Devashish Mitra. 2005. Political Ideology and Endogenous Trade Policy: An Empirical Investigation. *The Review of Economics and Statistics* 87 (1): 59 - 72.
- Esping-Andersen, Gosta. 1990. The Three Worlds of Welfare Capitalism. Princeton: Princeton University Press.
- Feldstein, Martin S., James R. Hines, and R. Glenn Hubbard. 1995. Taxing multinational corporations. Chicago: University of Chicago Press.
- Feliciano, Z. and R. Lipsey. 1999. Foreign Ownership and Wages in the United States,

- 1987-1992. *NBER Working Paper* no. 6923.
- Franzese, Robert J. 2002. Electoral and Partisan Cycles in Economic Policies and Outcomes. *Annual Review of Political Science* 5 (1): 369 - 421.
- Garrett, Geoffrey. 1998. Partisan politics in the global economy. *Cambridge studies in Comparative Politics*. New York: Cambridge University Press.
- Goldthorpe, John, editor. 1984. Order and Conflict in Contemporary Capitalism. Oxford, UK: Clarendon Press.
- Griffith, R.. 1999. Using the ARD Establishment Level Data to Look at Foreign Ownership and Productivity in the United Kingdom. *The Economic Journal*, vol. 109 (456): 931-959.
- Grossman, Gene M., and Elhanan Helpman. 1996. Foreign Investment with Endogenous Protection. In Robert C. Feenstra, Gene M. Grossman, and Douglas A. Irwin, editors, *The Political Economy of Trade Policy. Papers in Honor of Jagdish Bhagwati*. Cambridge, MA: MIT Press.
- Haggard, Stephan. 1990. Pathways from the periphery: The Politics of Growth in the Newly Industrializing Countries. Ithaca, NY: Cornell University Press.
- Hanson, Gordon H.. 2001. Should Countries Promote Foreign Direct Investment? *G-24 Discussion Paper* 9 (February 2001). Geneva: United Nations Conference on Trade and Development.
- Hanson, Gordon H., Raymond J. Mataloni, Jr., and Matthew J. Slaughter. 2001. Expansion Strategies of U.S. Multinational Firms. *Brookings Trade Forum* 2001: 245 - 282.
- Henisz, W. J. 2002. The institutional environment for infrastructure investment. *Industrial and Corporate Change* 11 (2): 355 - 389.
- Henisz, W. J., and J. G. Williamson. 1999. Comparative Economic Organization: within and between countries. *Business and Politics* 1 (3): 261 - 276.
- Henisz, Witold J., and Bennet A. Zelner. 2001. The Institutional Environment for Telecommunications Investment. *Journal of Economics and Management Strategy* 10 (1): 123.
- Hibbs, Douglas A., Jr. 1977. Political Parties and Macroeconomic Policy. *The American Political Science Review* 71 (4): 1467 - 1487.
- Hibbs, Douglas A., Jr. 1992. Partisan theory after fifteen years. *European Journal of Political Economy* 8 (3): 361.
- Hines, James R.. 1997. Tax Policy and the Activities of Multinational Corporations. In Alan J. Auerbach, editor, *Fiscal Policy: Lessons from Economic Research*. Cam-

- bridge, MA: MIT Press.
- Hines, James R.. 1999. Lessons from Behavioral Responses to International Taxation. *National Tax Journal*, Vol. 52 (June 1999), pp. 305-322.
- Hines, James R. 2001. International taxation and multinational activity. Chicago: University of Chicago Press.
- Iversen, Torben. 1999. Contested economic institutions: the politics of macroeconomics and wage bargaining in advanced democracies. *Cambridge studies in comparative politics*. New York: Cambridge University Press.
- Janeba, Eckhard. 2001. Global corporations and local politics: a theory of voter backlash. *NBER working paper series* no. 8254: National Bureau of Economic Research.
- Jensen, Nathan M. 2003. Democratic Governance and Multinational Corporations: Political Regimes and Inflows of Foreign Direct Investment. *International Organization* 57 (3), 587-616.
- Jensen, Nathan M. 2006. Nation-States and the Multinational Corporation: Political Economy of Foreign Direct Investment. Princeton, NJ: Princeton University Press.
- Katz, L., and K. Murphy. 2000. Change in Relative Wages 1963-1987: Supply and Demand Factors. *Quarterly Journal of Economics*, 107 (1), 35-78.
- Krusell P., L. Ohanian, V. Rios-Rull, and G. Violante. 2000. Capital-Skill Complementarity and Inequality: A Macroeconomic Analysis. *Econometrica: Journal of the Econometric Society*, 68 (5), 1029-53.
- Kydland, Finn E., and Edward C. Prescott. 1977. Rules Rather than Discretion: The Inconsistency of Optimal Plans. *The Journal of Political Economy* 85 (3): 473 - 492.
- Levy, Brian, and Pablo T. Spiller. 1994. The Institutional Foundations of Regulatory Commitment: A Comparative Analysis of Telecommunications Regulation. *Journal of Law, Economics, and Organization* 10 (2): 201 - 246.
- Li, Quan, and Andrea Mihalache. 2006. Political Determinants of Sectoral FDI Inflows. Paper presented at the *Annual Meeting of the International Studies Association*, Town & Country Resort and Convention Center, San Diego, California, USA, Mar 22, 2006
- Li, Quan and Adam Resnick. 2003. Reversal of Fortunes: Democracy, Property Rights and Foreign Direct Investment in Developing Countries. *International Organization* 57 (1), 1-37.
- Lipsey, Robert E. 2001. Foreign direct investment and the operations of multinational firms: concepts, history, and data. *NBER Working Papers Series* no. 8665, National Bureau of Economic Research.
- Lipsey, Robert E. 2004. The Labour Market Effect of US FDI in Developing Countries.

- ILO Employment Strategy Papers 2004/6*, Geneva: International Labour Organization.
- Mardon, Russell. 1990. The State and the Effective Control of Foreign-Capital - the Case of South-Korea. *World Politics* 43 (1): 111-138.
- Mataloni, Raymond J., Jr. 1995. A guide to BEA statistics on U.S. multinational companies. *Survey of Current Business* 75 (3): 38 - 55.
- Milner, Helen V., and Benjamin Judkins. 2004. Partisanship, Trade Policy, and Globalization: Is There a Left-Right Divide on Trade Policy? *International Studies Quarterly* 48 (1): 95 - 120.
- Moran, Theodore H. 1974. Multinational corporations and the politics of dependence: copper in Chile. Princeton, NJ: Princeton University Press.
- Nicolas, Françoise. 2001. A case of government-led integration into the world economy. in Frdrique Sachwald, editor, *Going multinational: the Korean experience of direct investment. Studies in global competition*. London: Routledge.
- Nicolas, Françoise. 2003. FDI as a factor of economic restructuring: the case of South Korea. In A. Bende-Nabende, editor, *International trade, capital flows, and economic development in East Asia: the challenge in the 21st century*. Aldershot, Hampshire: Ashgate.
- Oneal, John R. 1994. The affinity of foreign investors for authoritarian regimes. *Political Research Quarterly* 47 (3), 565-588.
- Persson, Torsten, and Guido Enrico Tabellini. 2000. Political economics: explaining economic policy. Cambridge, MA: MIT Press.
- Pinto, Pablo M.. 2004. Domestic Coalitions and the Political Economy of Foreign Direct Investment. *Ph.D. dissertation*, Department of Political Science, University of California, San Diego, La Jolla, CA.
- Pinto, Pablo M. and Santiago M. Pinto. 2006. The Politics of Investment: Partisanship and the Activity of Multinational Corporations. Paper presented at the Inaugural Conference of the *International Political Economy Society*, held at Princeton University, November 17-18, 2006.
- Sachwald, Frédérique, editor. 2001. *Going multinational: the Korean experience of direct investment. Studies in global competition*. London: Routledge.
- Sachwald, Frédérique. 2003. FDI and the Economic Status of Korea: The Hub Strategy in Perspective. Confrontation and innovation on the Korean Peninsula. *Korea Economic Institute's Ad-hoc Annual Publication* 5: 85-95, KEIA, Washington, DC.
- Spiller, P. T., and M. Tommasi. 2003. The institutional foundations of public policy: A transactions approach with application to Argentina. *Journal of Law Economics and*

- Organization* 19 (2): 281 - 306.
- Stata Corporation. 2003. Stata Cross-Sectional Time-Series Reference Manual.
- Stolper, Wolfgang F., and Paul A. Samuelson. 1941. Protection and Real Wages. *The Review of Economic Studies* 9 (1): 58 - 73.
- Tufte, Edward R. 1978. Political control of the economy. Princeton, NJ: Princeton University Press.
- Tybout, J.. 2000. Manufacturing Firms in Developing Countries: How Well Do They Do, and Why? *Journal of Economic Literature*, 38 : 11-44.
- UNCTAD. 2001. World Investment Report 2001. Promoting Linkages. New York: United Nations.
- UNCTAD. 2003. World Investment Report 2003. FDI Policies for Development: National and International Perspectives. New York, NY: United Nations.
- Vernon, Raymond. 1971. Sovereignty at bay; the multinational spread of U.S. enterprises. *The Harvard multinational enterprise series*. New York, NY: Basic Books.
- Whiting, Van R. 1992. The political economy of foreign investment in Mexico: nationalism, liberalism, and constraints on choice. Baltimore, MD: Johns Hopkins University Press.
- Williamson, Oliver E. 1985. The economic institutions of capitalism: firms, markets, relational contracting. New York, NY: Free Press.
- Yun, Mikyung. 2003. FDI and corporate restructuring in post-crisis Korea. In S. Haggard, W. Lim and E. Kim, editors, *Economic crisis and corporate restructuring in Korea: reforming the chaebol*. New York, NY: Cambridge University Press.

Table 1: Coefficient on Left (OECD sample, 1980 – 2000)

Dependent Variable: FDI Inflows into Sector  $i$  as a Proportion of Country Investment

Sector Code	Sector	Coeff.	PCSE	Sign, Signif.
1	Agriculture and fishing	0.003	(0.011)	+
2	Mining and quarrying	0.359	(0.154)	+ **
3	Food products	0.307	(0.079)	+ ***
4	Textile and wood	0.081	(0.127)	+
5	Petroleum, chemical, etc.	0.796	(1.397)	+
6	Metal and mechanical	0.432	(0.228)	+ *
7	Machinery, computers, etc.	0.155	(0.213)	+
8	Vehicles and transport	0.353	(0.129)	+ ***
9	Electricity, gas and water	0.356	(0.207)	+ *
10	Construction	-0.073	(0.026)	- ***
11	Trade and repairs	0.178	(0.116)	+
12	Hotels and restaurants	-0.015	(0.088)	-
13	Transportation	-0.067	(0.040)	- *
14	Telecommunications	0.911	(0.484)	+ *
15	Financial Intermediation	1.496	(0.432)	+ ***
16	Real estate	-0.044	(0.064)	-
17	Other business activities	-0.059	(1.090)	-

Heteroscedastic Panel Corrected Standard errors in brackets.

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

Table 2: Effect FDI Inflows on Average Wages and Labor Costs

Dependent Variable	(1) $\Delta \ln(\text{Wage}/\text{Emp})$		(2) $\Delta \ln(\text{Labr}/\text{Emp})$	
Left ( $\gamma_1$ )	-0.00315 (0.00330)		0.00020 (0.00216)	
FDI Inflows, \$ billion ( $\gamma_2$ )	0.00005 (0.00004)		0.00006 (0.00004)	
Left $\times$ FDI Inflows ( $\gamma_3$ )	0.00009 (0.00004)	**	0.00008 (0.00004)	**
$\Delta \ln(\text{Value Added}/\text{Employee})$	0.65675 (0.09199)	***	0.76565 (0.04646)	***
$\Delta \ln(\text{Real GDP per capita})$	-0.12538 (0.11073)		-0.08530 (0.06385)	
$\Delta$ Openness	-0.00269 (0.00089)	***	-0.00184 (0.00056)	***
$\Delta$ Unemployment	-0.00783 (0.00228)	***	-0.00657 (0.00109)	***
$\Delta$ Inflation	0.00094 (0.00148)		0.00016 (0.00059)	
Constant	0.00756 (0.01188)		0.02813 (0.01346)	**
Country Dummies	Yes		Yes	
Year Dummies	Yes		Yes	
Observations	232		409	
Groups	18		24	
$R^2$	0.8523		0.8834	
Wald $\chi^2$	1027.2		3015.0	
Prob > $\chi^2$	0.0000		0.0000	

Note: Heteroscedastic Panel Corrected Standard errors in brackets.

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

Table 3

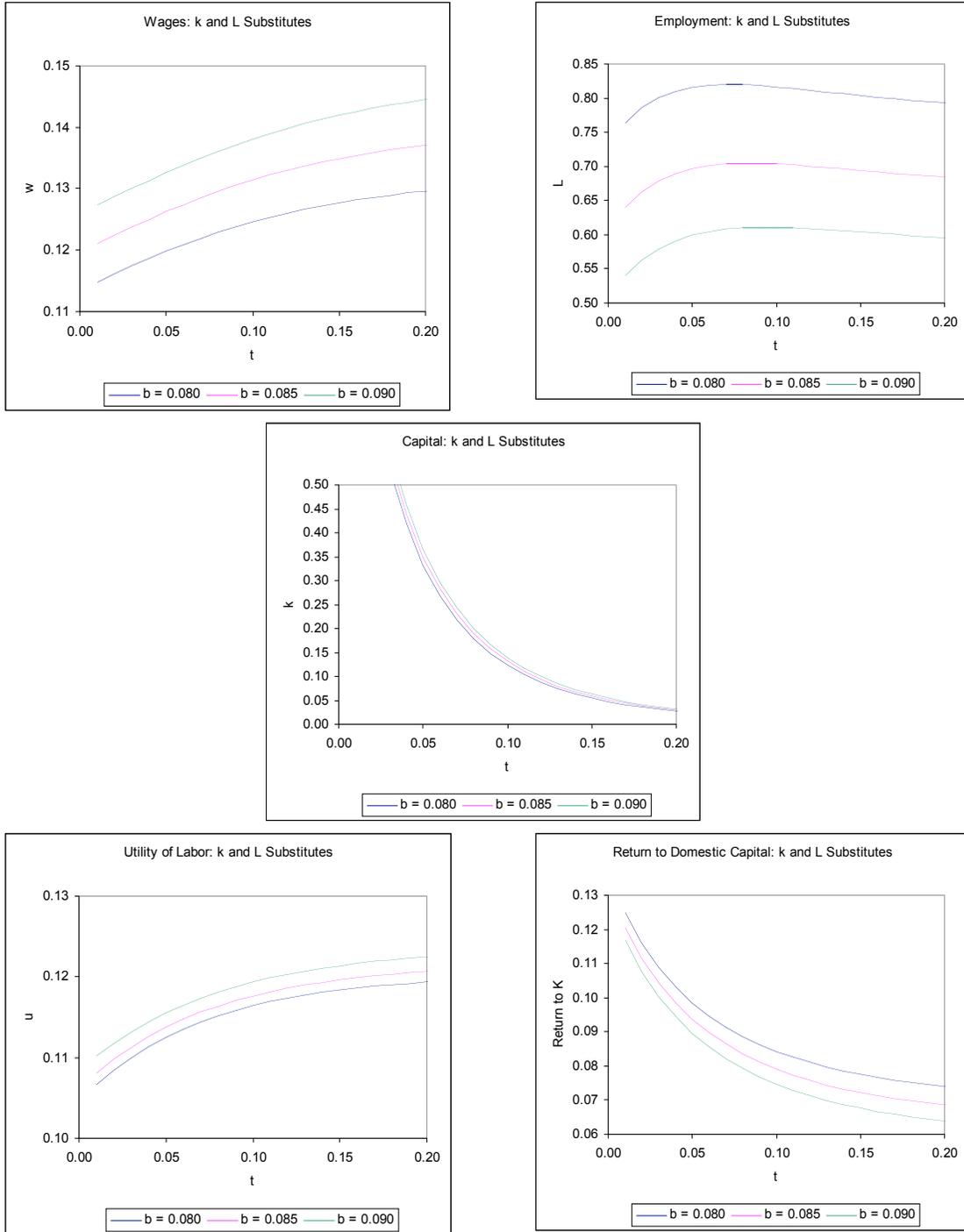
Correlation between FDI Inflows and Wages and Employment  
Under Left Governments (by Sector)

Sector Code	Description	DV: Inflows <sub>ij</sub> Sign, Signif. (1)	DV: $\Delta\text{wage}_{ij}/Y_{ij}$ Sign, Signif. (2)	DV: $\Delta\text{Empl}_{ij}/\text{Pop}_j$ Sign, Signif. (3)
1	Agriculture and fishing	+	+	+
2	Mining and quarrying	+	**	+
3	Food products	+	***	-
4	Textile and wood	+	+	- **
5	Petroleum, chemical, etc.	+	+	+
6	Metal and mechanical	+	*	-
7	Machinery, computers, etc.	+	+	-
8	Vehicles and transport	+	+	+
9	Electricity, gas and water	+	*	+
10	Construction	-	***	+
11	Trade and repairs	+	+	-
12	Hotels and restaurants	-	-	+
13	Transportation	-	*	-
14	Telecommunications	+	*	+
15	Financial Intermediation	+	***	+
16	Real estate	-	+	+
17	Other business activities	-	+	+

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

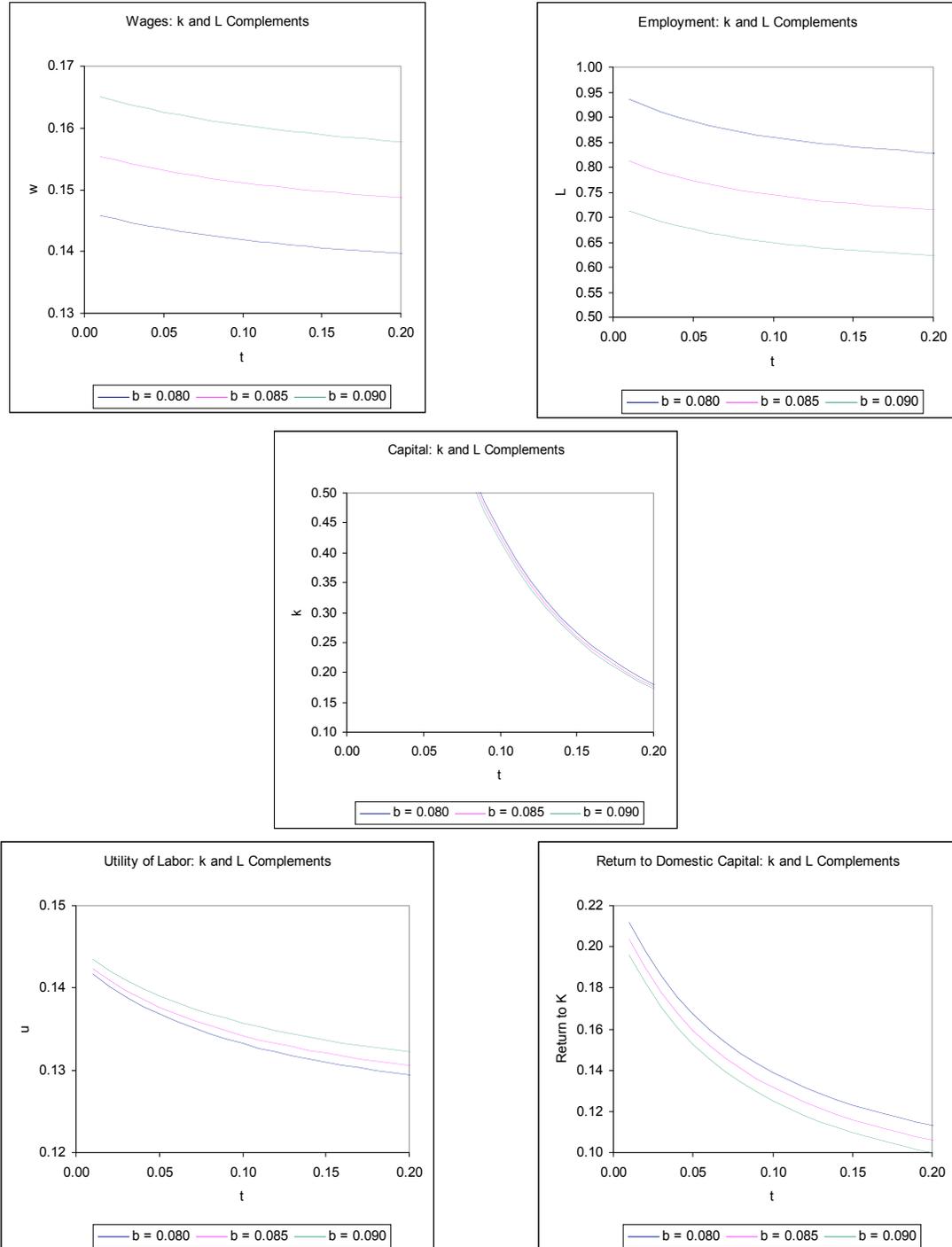
(1) Coefficient on  $\text{Left}_j$  (see Table 1); (2) Coefficient on  $\text{Inflows}_{ij}$ ; (3) Coefficient on  $\text{Inflows}_{ij}$

Figure 1: Relationship between  $t$  and  $L$ ,  $w$ ,  $k$ ,  $u$  and  $\tilde{\pi}$  for different values of  $b$ :  $\rho > \beta$



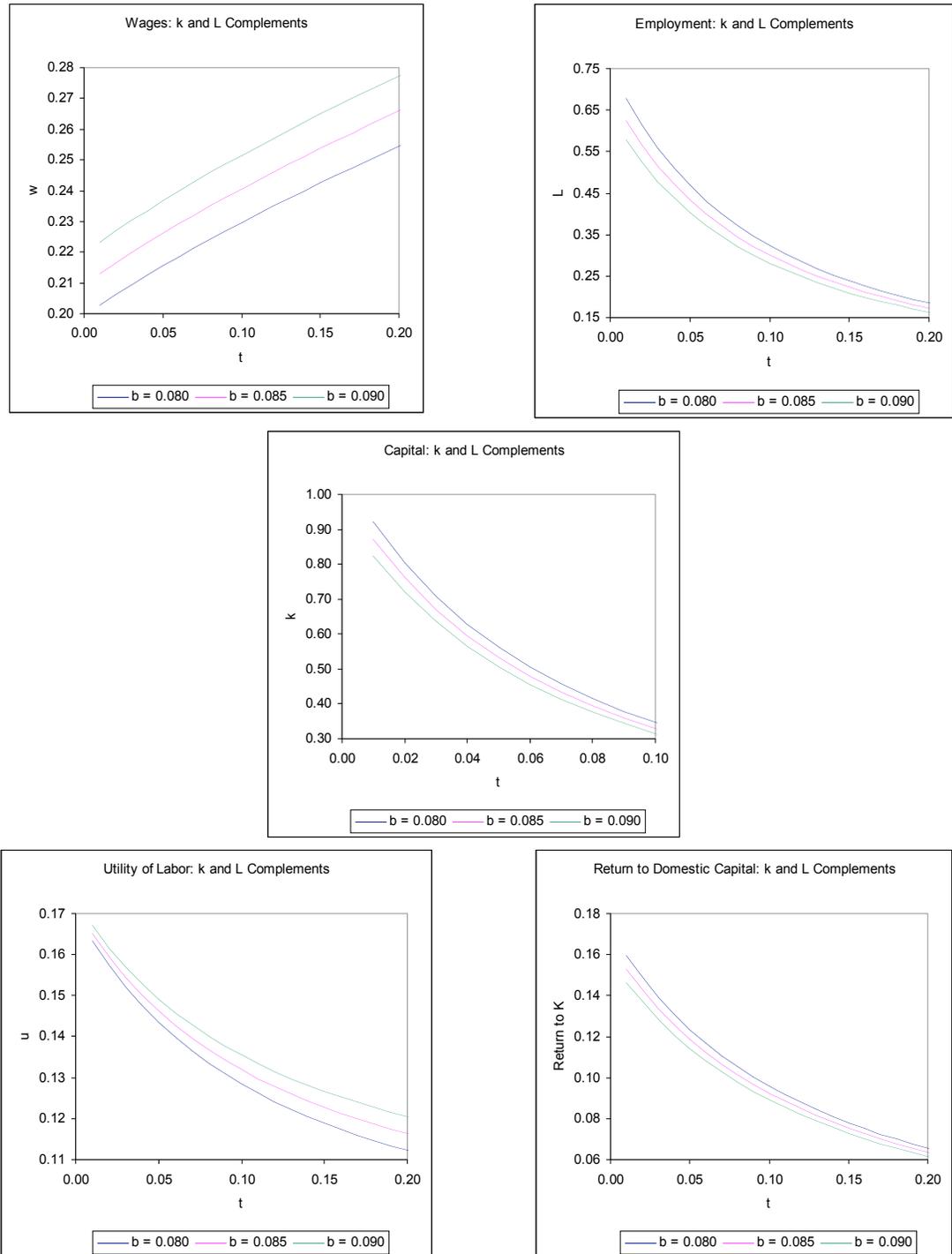
Parameter values:  $r = 0.10$ ,  $A = 0.20$ ,  $a = 1$ ,  $K = 1$ ,  $\beta = 0.60$ ,  $\rho = 0.75$ .

Figure 2: Relationship between  $t$  and  $L$ ,  $w$ ,  $k$ ,  $u$  and  $\tilde{\pi}$  for different values of  $b$ :  $0 < \rho < \beta$



Parameter values:  $r = 0.10$ ,  $A = 0.20$ ,  $a = 1$ ,  $K = 1$ ,  $\beta = 0.60$ ,  $\rho = 0.50$ .

Figure 3: Relationship between  $t$  and  $L$ ,  $w$ ,  $k$ ,  $u$  and  $\tilde{\pi}$  for different values of  $b$ :  $\rho < 0$



Parameter values:  $r = 0.10$ ,  $A = 0.70$ ,  $a = 1$ ,  $K = 1$ ,  $\beta = 0.60$ ,  $\rho = -1.00$ .