Econ. Gov. (2004) 5: 255–267
DOI: 10.1007/s10101-004-0078-6

Economics of Governance

A political economy model of immigration quotas*

J. Atsu Amegashie

Department of Economics, University of Guelph, Guelph, Ontario, Canada N1G 2W1
(e-mail: jamegash@uoguelph.ca)

Received June 4, 2003 / Accepted June 23, 2004

Abstract. The paper examines a model in which the number of immigrants allowed into a country is the outcome of a costly political lobbying contest between a firm and a union. The union and the firm bargain over the wage of natives after the number of immigrants that will be permitted is known. I assume that the lobbying contest is an all-pay auction (i.e., the lobbyist with the higher effort wins with certainty). Comparative statics results are derived to show how the reservation wage of immigrants, the price of the firm's product, the size of the union and the cost of lobbying affect immigration quotas and the post-immigration wage of natives.

Key words: All-pay auction, contests, immigration quotas, lobbying

JEL Classification Numbers: D72, D73, J5, J61

1. Introduction

Several factors influence the number of immigrants allowed into a country. Some of these include excess demand for labor, competing opportunities in other countries [Devoretz and Maki (1983)], humanitarian reasons, and family re-unification as is the case in Canada's immigration policy [see also Akbar and Devoretz (1993) and Borjas (1994)].

It is widely recognized that a political lobbying process also influences the number of immigrants into a country [see, for example, Benhabib (1996), Borjas

* I thank the editor, Amihai Glazer, Don Devoretz, Dan Usher, and three anonymous referees for helpful comments. My thanks are especially due to Doug Allen and Gordon Myers who supervised this work as part of my doctoral thesis at Simon Fraser University, Canada. An earlier version of this paper was circulated as RIIM working paper #00-01, Simon Fraser University, Canada and also presented at the 2001 meetings of the Canadian Public Economics Study Group in Montreal, Canada.

(1994), Goldin (1994), Green and Green (1996)]. For example Goldin (1994, p. 223) writes: "Because the story of immigration restriction is a legislative one, its main players will be representatives, senators, and presidents. But behind the legislative tale are the shifting interests of various groups. The first is organized labor ... and unorganized labor. Owners of capital are the second ... and immigrants both new and old are the third." The interests of these groups will differ because immigration has different effects on them. For example, immigration may depress the wages of unskilled workers resulting in an increase in the share of income accruing to skilled workers and capital owners. Borjas (1995) calls this gain the "immigration surplus". Indeed, some empirical papers have shown that immigration could depress the wages of the native born [see, for example, Borjas (1994) and the references cited therein]. However, in theory, this depends on one's assumptions about the human capital content of immigrants and whether they are substitutes or complements to native labor.

Apart from Epstein and Nitzan (2003), no work formally shows – to the best of my knowledge – how lobbying may influence the number of immigrants.[1] Benhabib (1996) uses a median-voter model to determine the quality of immigrants but not the number of immigrants allowed into a country.[2] He suggests that examining the latter issue will be an interesting research endeavor. Indeed, on a more general note, Borjas (1994, p. 1693) observes: "... further research on the political economy of immigration might greatly improve our understanding of the properties of the equilibrium in the immigration market."[3]

In this paper, I model an immigration lobbying contest between a firm and a union. I examine how the reservation wage of immigrants, the cost of lobbying, and the price of the firm's product affect the permissible number of immigrants. By "permissible number" of immigrants, I simply mean the number of immigrants that would be allowed into a country (i.e., the immigration quota). One may think of this as the annual target level of immigration in Canada, which is tabled by the minister under the 1976 Immigration Act or as the annual quota of visas under the USA visa lottery scheme.[4] Indeed, my model should be viewed as one which examines immigration quotas for cheap low-skill foreign labor which competes with domestic labor. In this regard, the quota for the USA visa lottery is applicable.

[1] My model differs from Esptein and Nitzan (2003) in certain respects: first, they use a contest success function in which the contestant with the highest effort does not necessarily win. In my model, the contestant with the highest effort necessarily wins. Second, I investigate the effects of the price of immigrant labor and the size of the union on the immigration quota while Epsten and Nitzan (2003) do not (at least not explicitly). Epstein and Nitzan (2003) model the behavior of the politician who determines the immigration quota. My model is less explicit in this regard.

[2] See also Hillman and Weiss (1999) who use a median-voter model to examine permissible illegal immigration. This paper focuses on legal immigrants.

[3] As discussed above, there are factors other than lobbying which determine the number of permissible immigrants. However, some of these factors may well be related to lobbying. For example, even if the number of immigrants is partly determined by excess demand in the labor market as in Devoretz and Maki (1983), this information could be supplied by firms as part of their lobbying efforts. Hence it is reasonable to assume that immigration quotas are the outcome of a political lobbying process.

[4] For recent analyses of immigration quotas, see Myers and Papageorgiou (2000, 2002).

The standards for immigrating to the USA for visa lottery winners are not high. The minimum educational qualification is the completion of high school.

The paper is organized as follows: in the next section, I present a lobbying contest between a union and firm in which the contestant with the higher effort is the winner (i.e., all-pay auction). In Sect. 3, I discuss my results. Section 4 concludes the paper.

2. The model

Consider a firm which hires immigrant labor and native labor. Let the wage of a native worker, in the absence of immigrants, be $\bar{w}_N$. The post-immigration wage of the natives is w_N. So $w_N = \bar{w}_N$, if there are no immigrants. The number of native workers is fixed at $\bar{L}_N$. Suppose the firm has the production function, $f(L) = L^\sigma$, where $L = \bar{L}_N$+ L_I is the total number of workers, L_I is the total number of immigrant workers, and $0 < \sigma < 1$. Note that the higher is σ, the higher is the marginal product of labor. I assume that all immigrants are paidw_I, their reservation wage. Assume that the firm sells its final product at a constant price, p $> \bar{w}_N$.[5]

I assume that one firm employs all workers.[6] This is a strong assumption. But a company like Wal-Mart which is the largest private-sector employer in the USA is approximately close. Indeed, given its staggering size and rapid expansion, Wal-Mart increasingly sets the standard for wages and benefits throughout the U.S. economy. Of the 10 richest people in the world, five are Waltons – the ruling family of the Wal-Mart empire. Wal-Mart is not fully unionized but it has had legal battles in court with the United Food and Commercial Workers International Union (UFCW) who want to encourage Wal-Mart workers to belong to their union. Recently, the workers at the Sam's Club (a division of Wal-Mart Stores Inc.) on Spring Mountain and Rainbow in Las Vegas, Nevada have signed up a majority of their co-workers to have the UFCW Union Local 711 to represent them. It is realistic to assume that the UCFW cares about Wal-Mart workers and therefore has the incentive to lobby the government on their behalf. Notice that Wal-Mart employs non-union labor and union labor, which is consistent with my model.

The firm's and union's lobbying expenditures are y and x respectively. The expenditures of both lobbyists are sunk, whether they win or lose the contest. The contest is an all-pay auction where the party with the higher expenditure wins with certainty.[7] Baye et al. (1993) and Che and Gale (1998) argue that a politician might

[5] I assume that the firm is a monopolist, so its price should be some decreasing function of output, f(L). However, I assume that the price is constant (independent of output) to simplify the analysis. This also allows me to examine the comparative statics of a change in price.

[6] The immigration contest in Epstein and Nitzan (2003) is between a union and capital owners. But capital owners are treated as a single entity in their model.

[7] Baye et al. (1993) Che and Gale (1998), Glazer and Konrad (1999) and Konrad (2000) have used the all-pay auction to examine political corruption, caps on campaign contributions, taxation, and strategic trade policy. It is important to note that there is a fundamental difference between the lobbying model in this paper and the menu-auction models of Bernheim and Whinston (1986) and Helpman and Grossman (1994). In the menu auction model, the lobbyists announce their bids contingent on the politician's actions. In other words, it is not possible for a lobbyist to spend money and effort on lobbying without

choose this contest success function if his objective is to maximize his campaign contributions or his income from bribery.

I use an imperfectly competitive model of both the product and labor markets. It would seem natural to use a perfectly competitive model to examine this issue since that produces a conflict between labor and the owners of capital with respect to their preferences for immigration. I do not use a perfectly competitive model because it gives a corner solution for the immigration quota chosen by the firm. However, for the sake completeness, I present the analysis for the competitive case in Appendix A and explain why it may not be a desirable model.

I consider two stages of this game. The timing of actions is as follows: in stage 1, the union and the firm lobby over the number of immigrants that should be allowed into the country. In stage 2, after the outcome of the lobbying game is known, the parties bargain over the wage holding the employment level of native workers constant.[8]

In stage 1, I assume, for simplicity, that the union lobbies for zero immigration. I shall later argue that this is not a strong assumption. The firm lobbies for a positive immigration quota.

I solve the game backwards. I first solve the bargaining sub-game and then solve the lobbying sub-game. Let w_N^a be the wage of the native workers when there is no agreement between the firm and the union. This is the wage of natives in alternative employment or if they do not work with this particular firm. Call this the reservation wage of natives. In the event of no agreement, the firm will only employ immigrants. The analysis still goes through if the firm employs a fraction, λ, of the native labor force in the event of a disagreement, where $0 < \lambda < 1$. I shall argue that the bargaining game is not crucial to the analysis.

Hence the Nash bargaining product may be written as

$$\Omega = [w_N\bar{L}_N - w_N^a\bar{L}_N][p(\bar{L}_N + L_I)^\sigma - w_I L_I - w_N\bar{L}_N - (pL_I^\sigma - w_I L_I)], \tag{1}$$

getting what he lobbied for. Hence the politician has to deliver before he is paid. In the model used in this paper, lobbying expenditures (which need not be money given to the politician) are incurred by all the lobbyists before the politician takes an action. Hence there will be winners and losers in this model. As argued by Baye et. al (1993), this is likely to be the timing of payments, if politicians do not want to be seen as being in the business of selling political favors. Also, if one were to use the model in Helpman and Grossman (1994), one would have to assume that each lobbyist announces a contribution schedule (i.e., a payment to the politician for each quota chosen). This may not always be the case, since lobbyists may only announce one preferred quota level and lobby for that quota instead of a schedule of quota levels.

[8] Since the union wants to maximize its total wage receipts, one could instead assume that the wage of natives is held constant but the union and the firm bargain over employment. So long as immigration reduces the employment of natives or reduces their wage, whether the union and firm bargain over only the wage or employment will not affect the analysis. If they bargain simultaneously over the wage and employment, that will complicate the model without adding any additional insight. Besides, it is debatable
whether firms and unions bargain over wages and employment simultaneously (see, for example, Booth, 1995, p. 128).

where $0 < \sigma < 1$ and $L_I \geq 0$. The maximand in (1) can be rewritten as

$$\Omega' = \log(w_N \bar{L}_N - w_N^a \bar{L}_N) + \log[p(\bar{L}_N + L_I)^\sigma - w_I L_I - w_N \bar{L}_N - (pL_I^\sigma - w_I L_I)] \tag{1a}$$

Maximizing (1a) with respect to w_N gives

$$w_N^* = \frac{p(\bar{L}_N + L_I)^\sigma - pL_I^\sigma + w_N^a \bar{L}_N}{2\bar{L}_N} \tag{2}$$

From (2), $\bar{w}_N^*$, the wage of the natives when the union wins the lobbying game (i.e., $L_I = 0$), is

$$\bar{w}_N^* = \frac{p(\bar{L}_N)^\sigma + w_N^a \bar{L}_N}{2\bar{L}_N} \tag{3}$$

It follows from (2) that $\partial\bar{w}_N^*/\partial L_I < 0$, given that $0 < \sigma < 1$. In subsequent analysis, it will be obvious to the reader that the bargaining game is not crucial to the analysis. What matters is that the wage of native workers is decreasing in the number of immigrant workers. I could have assumed this result (i.e., $\partial\bar{w}_N^*/\partial L_I < 0$) without deriving it from any model. The bargaining model is presented to show how one might derive this result. Certainly, there are other ways of doing so. Epstein and Nitzan (2003) assume a similar result without proof. They assume that foreign workers and local workers are substitutes such that the utility of local workers is inversely related to the immigration quota.

I assume that $w_N^a > w_I$. The assumption that the reservation wage of immigrants is lower than the reservation wage of natives is not too strong. Usually, immigrants are initially willingly to work for lower wages than natives. Given that $\partial\bar{w}_N^*/\partial L_I < 0, w_N^* \leq w_I$, if L_I is sufficiently high. To ensure that $w_N^* > w_I$, I assume that L_I is sufficiently small.

Given that the contest is all-pay auction, the probability that the firm wins is

$$\theta(x, y) = \begin{cases} 1 & \text{if } y > x \\ 1/2 & \text{if } y = x \\ 0 & \text{if } y < x \end{cases}$$

The union's success probability is $1 - \theta(x, y)$. I shall draw on results – in the all-pay auction literature – by Hillman and Riley (1989), Ellingsen (1991) and Baye, Kovenock and de Vries (1993, 1996) to solve the lobbying game.

A standard result in all-pay auctions is that there is no equilibrium in pure strategies. To see this, suppose the valuations of the firm and union are V^f and V^u respectively. Suppose the union bids $0 < x \leq V^u$. Then the firm's optimal response is $y = x + \varepsilon < V^f$ (i.e., marginally higher than x). But then $x > 0$ cannot be an optimal response to $y = x + \varepsilon$. Also it is obvious that $x = y = 0$ cannot be an equilibrium. Hence, there is no equilibrium in pure strategies.

The contestants' valuations are $V^f = [p(\bar{L}_N + L_I)^\sigma - w_I L_I - w_N^* \bar{L}_N - (p\bar{L}_N^\sigma - \bar{w}_N^* \bar{L}_N)] > 0$ and $V^u = (\bar{w}_N^* - w_N^*)\bar{L}_N > 0$. The firm chooses L_I and given the L_I chosen, both contestants choose their lobbying expenditures, y and x.

I look for a mixed-strategy equilibrium. Note that the contestants' valuations are endogenous since they depend on L_I.

Without any loss of generality, suppose that $V^f > V^u$. This condition holds if $p[(\bar{L}_N + L_I)^\sigma - \bar{L}_N^\sigma] - w_I L_I > 0$.[9] Note that V^f is not necessarily greater than V^u, given $0 < \sigma < 1$. To ensure that $V^f > V^u$, I assume that w_I is sufficiently small and/or p is sufficiently high and/or σ sufficiently close to 1.

Suppose the firm lobbies for $\hat{L}_I$ immigrants. Let $\hat{V}^u$ and $\hat{V}^f$ be the valuations of the union and the firm (respectively) when $L_I = \hat{L}_I$ and assume that $\hat{V}^u < \hat{V}^f$. There is a unique equilibrium in mixed strategies given by the following cumulative distribution functions (see Hillman and Riley (1989), Ellingsen (1991) and Baye et al. (1996)):

$$G_f(y) = \frac{y}{\hat{V}^u} \text{ for } y \in [0, \hat{V}^u]$$

and

$$G_u(x) = 1 - \frac{\hat{V}^u}{\hat{V}^f} + \frac{x}{\hat{V}^f} \text{ for } x \in [0, \hat{V}^u].$$

The equilibrium c.d.f's show that the firm bids uniformly on $[0, \hat{V}^u]$, while the union puts a probability mass equal to $(1 - \hat{V}^u/\hat{V}^f)$ on $x = 0$.

The expected lobbying expenditures are

$$Ey* = \int_0^{\hat{V}^u} y dG_f(y) = \frac{\hat{V}^u}{2} \text{ and } Ex* = \int_0^{\hat{V}^u} x dG_u(x) = \frac{(\hat{V}^u)^2}{2\hat{V}^f}.$$

The probability that the firm wins the contest is equal to the probability that it bids more than the union's expected bid. This equals $[1 - G_f(Ex^*)] = [1 - Ex^*/\hat{V}^u] = (1 - \hat{V}^u/2\hat{V}^f)$. Then the probability that the union wins is $\hat{V}^u/2\hat{V}^f$. Note that there is nothing novel about my solution. Given $\hat{V}^u$ and $\hat{V}^f$, I have simply followed the solution method in Hillman and Riley (1989), Ellingsen (1991) and Baye et al. (1996).

I now determine the firm's choice of the number of immigrants. Since the firm's payoff in a mixed-strategy equilibrium is $\hat{V}^f - \hat{V}^u > 0$, it will choose $\hat{L}_I$ to maximize[10]

$$\hat{V}^f - \hat{V}^u = [p(\bar{L}_N + \hat{L}_I)^\sigma - w_I \hat{L}_I - p\bar{L}_N^\sigma]$$

[9] One may argue that this condition will always hold because the firm will only hire immigrants if its revenue from immigrants is greater than the total wage paid to them. This is not correct. The revenue from immigrants could be less than the total wage paid to them, but the firm will still want to hire them if their presence reduces the wage of natives sufficiently. This simply means that the firm must have a positive valuation for employing immigrants. That is, $V^f > 0$. But $V^f > 0$ does not necessarily imply $V^f > V^u$.

[10] Since the union's payoff is zero in this equilibrium, the assumption that it lobbies for zero immigration is not too strong, given that a positive level of immigration would also give a zero payoff.

This gives

$$\hat{L}_I^* = \left(\frac{\sigma p}{w_I}\right)^{1/(1-\sigma)} - \bar{L}_N \tag{4}$$

I assume that $\hat{L}_I^* > 0$. I also assume that $\hat{V}^f - \hat{V}^u > 0$, given $\hat{L}_I^*$.[11]

Noting that $V'' = (\bar{w}_N^* \bar{L}_N - w_N^* \bar{L}_n)$, it follows that $\hat{V}^u$ is increasing in $\hat{L}_I$, since $\partial w_N^* / \partial \hat{L}_I < 0$. Hence Ey^* is increasing in $\hat{L}_I$. However, a change in $\hat{L}_I$ has an ambiguous effect on Ex^*. This is because while an increase in $\hat{L}_I$ increases $\hat{V}^u$, it also leads to an increase in $\hat{V}^f$ over some range (e.g., $\hat{L}_I \leq \hat{L}_I^*$).

If the firm did not have to lobby for the number of immigrants, then it will choose the number of immigrants to maximize $[p(\bar{L}_N + \hat{L}_I)^\sigma - w_I \hat{L}_I - w_N^* \bar{L}_N]$. Let $\hat{L}_I^{**} = \text{argmax}[p(\bar{L}_N + \hat{L}_I)^\sigma - w_I \hat{L}_I - w_N^* \bar{L}_N]$. Then $\hat{L}_I^{**} > \hat{L}_I^*$ since $\partial w_N^* / \partial \hat{L}_I < 0$. This gives the following straightforward proposition:

Proposition 1. *The firm proposes a smaller number of immigrants when it has to lobby for its proposal compared to the number of immigrants it would have proposed in the absence of lobbying.*

Proposition 1 is similar to a recent result by Epstein and Nitzan (2002) who show that contestants will strategically restrain or limit their demands in contests in order to reduce the lobbying efforts of other contestants. In the specific context of an immigration game, Epstein and Nitzan (2003) find that the firm reduces its immigration quota while the union increases its immigration compared to their most preferred levels. By proposing a smaller immigration quota, the firm not only reduces its lobbying effort and its lobbying cost but also induces the union to reduce its lobbying effort. In my model, only the firm exercises strategic restraint (i.e., reduces its proposed immigration quota). Note that Epstein and Nitzan (2003) use an imperfectly-discriminating contest, so both the firm and union have positive expected payoffs, given their proposed immigration levels. Thus, they both exercise strategic restraint. In my model with an all-pay auction, one party will necessarily have a zero expected payoff. Hence, it is not possible to perform any meaningful analysis of its choice of immigration quota. It is, however, interesting to note that Epstein and Nitzan (2003) obtain a result similar to my Proposition 1 in a Tullock-type rent-seeking contest.

Putting $L_I = \hat{L}_I^*$ into Eq. (2) and differentiating with respect to w_I gives $\partial w_N^* \big/ \partial w_I = (p\sigma\beta)(\partial \hat{L}_I^* / \partial w_I)/(2\bar{L}_N) > 0$, where $\beta \equiv 1/(\bar{L}_N + L_I)^{1-\sigma} - 1/L_1^{1-\sigma} < 0$, given $\bar{L}_N > 0$ and $L_I > 0$. This leads to the following proposition:

Proposition 2. *The post-immigration wage of natives is increasing in the reservation wage of immigrants.*

[11] One might argue that lobbying is not in the interest of both parties. They could maximize the surplus from employing immigrants and share it. This may not be possible for the following reason: The firm might renege on the agreement once the legislature approves the surplus-maximizing immigration quota; that is the firm cannot commit to the surplus-sharing agreement. Note also that given the surplus-maximizing immigration quota the firm's threat point is bigger in the bargaining stage than it is when there is lobbying.
Hence it possible for the union to be better off with lobbying if the cost of lobbying is sufficiently small.

The intuition behind this result is as follows. An increase in the reservation wage of immigrants results in a fall in the firm's proposed immigration quota. This means that even if the firm wins the lobbying contest, its bargaining power during wage negotiations will be weaker, since it has fewer immigrants to employ. Note that if the union wins the lobbying contest, the immigration quota is zero.

The expected immigration quota is

$$\hat{L}_I^e = \left(1 - \frac{0.5\hat{V}^u}{\hat{V}^f}\right)\hat{L}_I^* \tag{5}$$

Differentiating the above equation with respect to w_I gives

$$\frac{\partial \hat{L}_I^e}{\partial w_I} = \left(1 - \frac{\hat{V}^u}{2\hat{V}^f}\right)\frac{\partial \hat{L}_I^*}{\partial w_I} - \frac{\hat{L}_I^*}{2\hat{V}^f}\left(\frac{\partial \hat{V}^u}{\partial w_I} - \frac{\hat{V}^u}{\hat{V}^f}\frac{\partial \hat{V}^f}{\partial w_I}\right) \tag{6}$$

The above derivative has a negative sign. The first term of this derivative is negative because $\partial\hat{L}_I^*/\partial w_I < 0$ and $\hat{V}^u/\hat{V}^f < 1$. Given that $\hat{V}^u/\hat{V}^f < 1$, the second term is also negative if $\partial\hat{V}^u/\partial w_I > \partial\hat{V}^f/\partial w_I$. This latter condition holds. To see this, rewrite the firm's valuation as $\hat{V}^f = [p(\bar{L}_N + \hat{L}_I^*)^\sigma - w_I\hat{L}_I^* - p\bar{L}_N^\sigma + \hat{V}^u]$. Then $\partial\hat{V}^f/\partial w_I - \partial\hat{V}^u/\partial w_I = [p\sigma(\bar{L}_N + \hat{L}_I^*)^{\sigma-1} - w_I][\partial\hat{L}_I^*/\partial w_I] - \hat{L}_I^* = -\hat{L}_I^* < 0$ since $p\sigma(\bar{L}_N + \hat{L}_I^*)^{\sigma-1} - w_I = 0$ from Eq. (4). Therefore, $\partial\hat{L}_I^e/\partial w_I < 0$. This gives the following proposition:

Proposition 3. *The lower is the reservation wage of immigrants, the higher is the expected immigration quota.*

A fall in w_I increases the valuations of the firm and union. This will generally increase their lobbying efforts. Hence, *a priori*, the effect of w_I on L_I^e is ambiguous. Proposition 1 is interesting because it gives a definite comparative static effect.

Similarly, $$\frac{\partial \hat{L}_I^e}{\partial p} = \left(1 - \frac{\hat{V}^u}{2\hat{V}^f}\right)\frac{\partial \hat{L}_I^*}{\partial p} - \frac{\hat{L}_I^*}{2\hat{V}^f}\left(\frac{\partial \hat{V}^u}{\partial p} - \frac{\hat{V}^u}{\hat{V}^f}\frac{\partial \hat{V}^f}{\partial p}\right). \tag{7}$$

The above derivative has an ambiguous sign. In what follows, I identify two sufficient conditions which will make this derivative positive. The first term of this derivative is positive because $\partial\hat{L}_I^*/\partial p > 0$ and $\hat{V}^u/\hat{V}^f < 1$. Given that $\hat{V}^u/\hat{V}^f < 1$, the second term is also positive if $\partial\hat{V}^f/\partial p$ is sufficiently bigger than $\partial\hat{V}^u/\partial p$. This will be the case if w_I is sufficiently low or σ is sufficiently high. To see this, note that $\partial\hat{V}^f/\partial p - \partial\hat{V}^u/\partial p = [p\sigma(\bar{L}_N + \hat{L}_I^*)^{\sigma-1} - w_I][\partial\hat{L}_I^*/\partial p] + [(\bar{L}_N + \hat{L}_I^*)^\sigma - \bar{L}_N^\sigma] = [(\bar{L}_N + \hat{L}_I^*)^\sigma - \bar{L}_N^\sigma] > 0$. This expression will be sufficiently big, if w_I is sufficiently low (i.e., $\hat{L}_I^*$ is sufficiently high) or σ is sufficiently high. Under these conditions, $\partial\hat{L}_I^e/\partial p > 0$. This leads to the following proposition:

Proposition 4. *If the marginal product of labor is sufficiently high and/or the reservation wage of immigrants is sufficiently low, then an increase in the price of the firm's final product results in an increase in the expected immigration quota.*

As in the case of Proposition 3, an increase in the price results in an increase in the valuations of both the firm and the union.[12] This will generally increase their lobbying efforts. Hence, *a priori*, the effect of p on L_I^e is ambiguous. Proposition 4 is interesting since it gives a sufficient condition that will guarantee a definite comparative static effect. When the price of its product increases, the firm will lobby sufficiently more than the union if the marginal product of cheap labor (i.e., immigrants) is sufficiently high or the price of immigrant labor is sufficiently low.

I now investigate changes in the size of the union on the expected immigration quota. This depends on the sign of the derivative below:

$$\frac{\partial \hat{L}_I^e}{\partial \bar{L}_N} = \left(1 - \frac{\hat{V}^u}{2\hat{V}^f}\right) \frac{\partial \hat{L}_I^*}{\partial \bar{L}_N} - \frac{\hat{L}_I^*}{2\hat{V}^f} \left(\frac{\partial \hat{V}^u}{\partial \bar{L}_N} - \frac{\hat{V}^u}{\hat{V}^f} \frac{\partial \hat{V}^f}{\partial \bar{L}_N}\right) \tag{8}$$

The above derivative has a negative sign. The first term of this derivative is negative because $\partial \hat{L}_I^*/\partial \bar{L}_N < 0$ and $\hat{V}^u/\hat{V}^f < 1$. Given that $\hat{V}^u/\hat{V}^f < 1$, the second term is also negative if $\partial \hat{V}^u/\partial \bar{L}_N > \partial \hat{V}^f/\partial \bar{L}_N$. This latter condition holds. To see this, rewrite the firm's valuation as $\hat{V}^f = [p(\bar{L}_N + \hat{L}_I^*)^\sigma - w_I \hat{L}_I^* - p\bar{L}_N^\sigma + \hat{V}^u]$. Then $\partial \hat{V}^f/\partial \bar{L}_N - \partial \hat{V}^u/\partial \bar{L}_N = [p\sigma(\bar{L}_N + \hat{L}_I^*)^{\sigma-1} - w_I][\partial \hat{L}_I^*/\partial w_I] + p\sigma[(\bar{L}_N + \hat{L}_I^*)^{\sigma-1} - \bar{L}_N^{\sigma-1}] < 0$ since $p\sigma(\bar{L}_N + \hat{L}_I^*)^{\sigma-1} - w_I = 0$ and $0 < \sigma < 1$. Therefore, $\partial \hat{L}_I^e/\partial \bar{L}_N < 0$. This gives the following proposition:

Proposition 5. *The bigger is the size of the union, the smaller is the expected immigration quota.*

The above analysis was based on $\hat{V}^f - \hat{V}^u > 0$. Suppose instead that at $\hat{L}_I^*, \hat{V}^f - \hat{V}^u \leq 0$. Then the payoff of the firm in the all-pay auction is zero, regardless of the number of immigrants chosen.[13] If the firm sets $\hat{L}_I = 0$, then the valuations of both contestants is zero and there is no lobbying. But this is not a Nash equilibrium.[14] Since the firm's payoff is zero, regardless of the number of immigrants chosen, we could assume that it chooses $L_I > 0$. Without any loss of generality, assume that the firm chooses some arbitrary immigration quota $L_I = \bar{L}_I$. Then the expected immigration quota is now

$$\tilde{L}_I^e = \frac{\hat{V}^f}{2\hat{V}^u} \bar{L}_I \tag{9}$$

Note that, in this case, $\hat{V}^u$ is not a function of w_I and p since $\bar{L}_I$ is not a function of these variables. It is straightforward to confirm the comparative statics results above. Thus my results hold even if the union has a higher valuation.

[12] It is probably not obvious that the union's valuation will increase when the price of the firm's product increases. The reader could verify this by substituting Eqs. (2) and (3) into the expression for the union's valuation and then obtain an expression for $\partial \hat{V}^u/\partial p$.

[13] I assume, however, that $\hat{V}^f > 0$ at $\hat{L}_I^*$.

[14] If the union knows that the firm is not lobbying, then it has the incentive to expend a positive but small lobbying effort, win the contest with certainty, and reduce the immigration quota to zero.

3. Discussion of results

Since my model is a partial equilibrium model, Proposition 4 (and probably all my propositions) will only make sense if we consider the immigration quota for a particular industry. Proposition 4 accords very well with intuition for it implies that the prospect of bigger profits will induce firms to lobby more for immigrants and increase the immigration quota, if immigrant labor is sufficiently cheap. I am inclined to believe that this is one of the most robust predictions of the model for it suggests that immigration quotas will increase when the economy is booming and will decrease when the economy is slowing down. Indeed, Shughart et al. (1986) find empirically that immigration restrictions are tighter during recessions and looser during expansions.

Proposition 3 says that cheaper immigrant labor induces an increase in immigration. This is also related to the fact that immigration restrictions are loosened during booms. What could be happening is that during booms, the growth of the economy results in a rise in the wages of domestic labor. Hence, immigrant labor becomes much more cheaper than domestic labor resulting in a demand by industry for more immigrants. An implication of this result is that economic decline in developing economies and the attendant declining reservation wages of workers from these countries will boost immigration flows. Indeed, there have been periods in history when there was massive immigration from developing countries to countries like the USA when these developing countries where experiencing economic decline. An example was the immigration of Africans to the USA when African countries were experiencing economic decline in the 1970s, 80s, and 90s.

One may argue that the result that cheaper labor leads to higher immigration quotas does not accord with historical facts. For example, quotas in the USA were historically larger for those countries with higher wages and presumably higher reservation wages. These were typically immigrants from European countries. But it may well be that the reservation wages of these European immigrants adjusted for their relatively higher skill was lower than that of immigrants from other countries which had lower wages and lower skills. Indeed, one can come with empirical facts for certain countries which contradict some of findings of this paper. This is because there is not one theory which can explain all of immigration policy. For example, nationalistic, cultural, and xenophobic tendencies also drive immigration policy.

Proposition 5 accords with intuition. One can think of the size of the union as a reflection of its political clout or how effectively it recruits workers to join the union. Hence Proposition 5 implies that countries with powerful unions have smaller levels of immigration compared to countries with less powerful unions.

I have looked at changes in variables which affect the valuations of the union and the firm in the same direction. In theory, it is not obvious that an increase in the valuations of the union and the firm should affect the equilibrium number of immigrants in an unambiguous way. This is because an increase in their valuations could result in an increase in their lobbying efforts. Since both parties have increased their lobbying efforts, the effect on the expected immigration quota could be ambiguous. The propositions in the paper offer definite comparative statics results under certain conditions.

Since the effects noted in the preceding paragraph are, in theory, ambiguous it is conceivable that one could construct a different lobbying model which will overturn the comparative statics results. Indeed, one does not have to go that far. For example, the derivative in Eq. (9) has an ambiguous sign. Like Epstein and Nitzan (2003), this paper should be seen as a first attempt to incorporate lobbying in formal models of immigration. Future research and extensions will shed more light on the issue.

4. Conclusion

There is some literature on the political economy of immigration. Formal models in this area have focussed on the median voter model. One drawback of the median voter model is that the intensity of voter preferences is not considered. This paper formally incorporates lobbying in a model of immigration.

The comparative statics results may hold in a model with no lobbying activity; for example, if the politician is a benevolent social planner. But this does not limit the paper's contribution. The reality is that immigration policy is partly driven by the lobbying activities of labor and capital. It is this reality that the paper attempts to capture. Note also that in a model with no lobbying, it will generally be the case that the expected immigration quota will be monotonically increasing in the price of the firm's final product, regardless of the level of the reservation wage (so long as immigrant labor is cheaper than native labor). This is not the case in this lobbying model. This is because more cheap immigrant labor requires more lobbying. The price of immigrant labor has to be very cheap or the productivity of immigrant labor must be sufficiently high for the firm to lobby sufficiently more than the union. Of course, in my model, there is no difference between the skills of immigrant and native labor.

Admittedly, my model is a very simple one and I recognize its limitations. Given that immigration is a dynamic issue, my static framework may ignore some very important issues. For example, immigrant workers may join the union, increasing its size over time or may form a coalition with the firm to lobby, if they care about other prospective immigrants. As indicated in the previous section, future research and extensions will hopefully extend the model in interesting ways.

Appendix A (The competitive case)

Without loss of generality, let the production function be $gf(L) = K^{\mu}L^{\sigma}$, where $\sigma + \mu = 1 (0 < \sigma < 1, 0 < \mu < 1)$;[15] K is the capital stock and $L = L_I + \bar{L}_N$. Let K be fixed at $\bar{K}$. In a competitive equilibrium, the wage rate will be $p\sigma(L_I + \bar{L}_N)^{\sigma-1}\bar{K}^{\mu}$. It follows that the wage rate is decreasing in the number of immigrants given $0 < \sigma < 1$. The return on capital is $p\mu(L_I + \bar{L}_N)^{\sigma}\bar{K}^{\mu-1}$ which is increasing in the number of immigrants. The valuation of capitalists is

[15] The analysis goes through so long as the production function $f(K, L)$ satisfies the usual neoclassical properties, $f_K > 0, f_L > 0, f_{KK} < 0, f_{LL} < 0$ and $f_{KL} > 0$.

$V^K = p\mu[(L_I + \bar{L}_N)^\sigma \bar{K}^{\mu-1} - (\bar{L}_N)^\sigma \bar{K}^{\mu-1}] > 0$ and the valuation of labor is $V^L = p\sigma[(\bar{L}_N)^{\sigma-1}\bar{K}^\mu - (L_I + \bar{L}_N)^{\sigma-1}\bar{K}^\mu] > 0$. Assuming that lobbying is an all-pay auction, the immigration quota chosen by capitalists is a corner solution since $\partial(V^K - V^L)/\partial L_I > 0$. Hence the immigration quota proposed by capitalists is independent of the parameters in the model. An implication of this result is that capitalists propose the *same* immigration quota, whether or not they have to lobby for their proposal. Their proposed immigration quota is independent of the cost of lobbying. I think this is, at worst, an undesirable result and at best, an uninteresting result.

Denote the optimal immigration quota chosen by capital by some finite number $\bar{L}_I$. The valuations in the all-pay auction can then be written as $\bar{V}^K = p\mu[(\bar{L}_I + \bar{L}_N)^\sigma \bar{K}^{\mu-1} - (\bar{L}_N)^\sigma \bar{K}^{\mu-1}]$ and $\bar{V}^L = p\sigma[(\bar{L}_N)^{\sigma-1}\bar{K}^\mu - (\bar{L}_I + \bar{L}_N)^{\sigma-1}\bar{K}^\mu]$. The expected immigration quota is

$$L^c = \left(1 - \frac{\bar{V}^L}{2\bar{V}^K}\right)\bar{L}_I,$$

if $\bar{V}^K > \bar{V}^L$.

An increase in $\bar{K}$ reduces the valuation of capitalists but increases the valuation of labor. Therefore, $\partial L^c/\partial \bar{K} < 0$. This result is due to the fact that an increase in the capital stock reduces the marginal productivity of capital (i.e., diminishing marginal productivity) resulting in a fall in the valuation of capitalists. The valuation of labor increases because of the complementarity between labor and capital. It is probably for this reason that the result that the immigration quota proposed by capitalists is independent of the parameters of the model is undesirable. For example, if capitalists propose a higher immigration quota when the capital stock increases, then $\partial L^c/\partial \bar{K}$ need not be necessarily negative. Note that $\partial L^c/\partial \bar{K} < 0$ also holds if $\bar{V}^K \leq \bar{V}^L$. In this case, the expected immigration quota is $(\bar{V}^K/2\bar{V}^L)\bar{L}_I$. Also $\partial L^c/\partial p = 0$.

References

Akbar, S., Devoretz, D.J. (1993) Canada's demand for third world highly trained immigrants: 1976–86. *World Development* 21: 177–187.

Baye, M.R., Kovenock, D., de Vries, C.G. (1993) Rigging the lobbying process: an application of the all-pay auction. *American Economic Review* 83: 289–294.

Baye, M.R., Kovenock, D., de Vries, C.G. (1996). The all-pay auction with complete information. *Economic Theory* 8: 291–305.

Benhabib, J. (1996) On the political economy of immigration. *European Economic Review* 40: 1737–1743.

Bernheim, B.D., Whinston, M.D. (1986) Menu auctions, resource allocation, and economic influence. *Quarterly Journal of Economics* 101: 1–31.

Booth, A.L. (1995) *The economics of the trade union*. New York: Cambridge University Press.

Borjas, G.J. (1994) The economics of immigration. *Journal of Economic Literature* 32: 1667–1717.

Borjas, G.J. (1995) The economic benefits of immigration. *Journal of Economic Perspectives* 9: 3–22.

Che, Y.K., Gale, I. (1998) Caps on political lobbying. *American Economic Review* 88: 643–651.

Devoretz, D.J., Maki, D. (1983) The immigration of third world professionals to Canada: 1968–1973. *World Development* 11: 55–64.

Ellingsen, T. (1991) Strategic buyers and the social cost of monopoly. *American Economic Review* 81: 648–657.

Epstein, G.S., Nitzan, S. (2002) Strategic restraint in contests. *European Economic Review* (forthcoming).

Epstein, G.S., Nitzan, S. (2003) The struggle over migration policy. Unpublished manuscript.

Glazer, A., Konrad, K. (1999) Taxation of rent-seeking activities. *Journal of Public Economics* 72: 61–72.

Goldin, C. (1994) The political economy of immigration restriction in the United States, 1890–1921. In: Goldin, C., Libecap, G.D. (eds.) *The Regulated Economy: A Historical Approach to Political Economy.* Chicago: University of Chicago Press.

Green, A., Green, D. (1996) The economic goals of Canada's immigration policy: past and present. *RIIM, Simon Fraser University, Vancouver, Working paper series*, # 96-04.

Grossman, G.M., Helpman, E. (1994) Protection for sale. *American Economic Review* 84: 833–850.

Hillman, A.L., Riley, J. (1989) Politically contestable rents and transfers. *Economics and Politics* 1: 17–39.

Hillman, A.L., Weiss, A. (1999) A theory of permissible illegal immigration. *European Journal of Political Economy* 15: 585–604

Konrad, K.A. (2000) Trade Contests. *Journal of International Economics* 51: 317–334.

Myers, G.M., Papageorgiou, Y.Y. (2000) Immigration control and the welfare state. *Journal of Public Economics* 75: 183–207.

Myers, G.M., Papageorgiou, Y.Y. (2002) Towards a better system of immigration control. *Journal of Regional Science* 42: 51–74.

Shughart, W.F., Tollison, R.D., Kimenyi, M.S. (1986) The political economy of immigration restriction. *Yale Journal on Regulation* 4: 79–97.