Bidding for brains: Intellectual property rights and the international migration of knowledge workers

Carol McAusland [a], Peter Kuhn [b,c,*]

[a] Food and Resource Economics, 337-2357 Main Mall, University of British Columbia, Vancouver, Canada BC V6T 1Z4
[b] Department of Economics, University of California, Santa Barbara CA 93106, United States
[c] NBER and IZA

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ABSTRACT

We introduce international mobility of knowledge workers into a model of Nash equilibrium IPR policy choice among countries. We show that governments have incentives to use IPRs in a bidding war for global talent, resulting in Nash equilibrium IPRs that can be too high, rather than too low, from a global welfare perspective. These incentives become stronger as developing countries grow in size and wealth, thus allowing them to prevent the 'poaching' of their 'brains' by larger, wealthier markets.

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1. Introduction

The notion that it is privately (but not globally) optimal for developing countries to 'free ride' on technological innovations produced by the developed world is well known in the intellectual property rights literature (see for example Chin and Grossman, 1990). Over the years, this literature has also identified a number of factors that might induce developing countries to protect intellectual property. These include the inappropriateness of Northern technology for the South (Diwan and Rodrik, 1991), strategic reactions by Northern firms to the lack of Southern protection (Yang and Maskus, 2001), dynamic effects on innovation in the South (Helpman, 1993; Chen and Puttitanun, 2005; Schneider, 2005), the prospects of increased foreign direct investment or licensing (Markusen, 2001; Maskus, 2005), and of expanded international trade (Maskus and Penubarti, 1995; Fink and Primo Baga, 2005).

An equally well known idea–in a different literature–is the notion that an outflow of skilled labor, or 'brain drain', hurts developing countries, due to diminished opportunities for within-country trade and fiscal externalities (e.g. Berry and Soligo, 1969; Bhagwati and Hamada, 1974). Countervailing factors that might create benefits from brain drain include increased incentives to acquire education in the sending country

arising from an 'emigration lottery' (Mountford, 1997) and added discipline on the sending country's tax authorities (Bucovetsky, 2003).

Perhaps surprisingly, the two literatures described above (on IPR policy in developing countries and the brain drain respectively) have remained largely isolated from each other.[1] This omission is particularly noteworthy in light of two key stylized facts. First, immigrants–including those from developing countries–account for a large fraction of U.S. innovative activity. For example, nearly one in five scientists and engineers in the United States is an immigrant (Zakaria, 2005), while foreign students comprised 51% of U.S. science and engineering Ph.D. recipients in 2003 (Bound et al., 2009).[2] Second, internationally mobile scientists can also represent a large share of sending countries' innovative talent. According to Docquier and

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* Corresponding author.
E-mail addresses: carol.mcausland@ubc.ca (C. McAusland), pjkuhn@econ.ucsb.edu (P. Kuhn).

[1] Mondal and Gupta (2008) introduce international labor mobility into Helpman's (1993) model, but treat IPR policy as exogenous and consider only the limiting case of perfect international labor mobility. Oettl and Agrawal (2008) empirically study the patent flows that *result* from international labor mobility. To our knowledge, no existing papers model the choice of IPR policy in the presence of internationally mobile innovative talent.

[2] These counts probably understate immigrants' contribution to U.S. innovation, since immigrant college graduates patent at twice the U.S. native rate (Hunt and Gauthier-Loiselle, 2010); immigrant graduate students also contribute disproportionately to U.S. innovation (Chellaraj et al., 2008). At the extreme top tail of the innovation distribution, Weinberg (2011) documents the flow of 'star' scientists out of developing nations, reporting a steep recent rise (to 14% for the 1990s) in the share of Nobel Prizes in Chemistry, Medicine and Physics awarded to researchers born in developing countries. *None* of this prize-winning work was done in a developing country.

Rapoport (2009), these flows are particularly high for countries that are both poor and relatively small, such as Guyana, Haiti, and Kenya: In 2000, 89, 84, and 47% of these countries' university-educated natives were living in developed (OECD) countries.

The goal of this paper is to study the interactions between IPR policy and brain drain. We do so by considering an IPR policy game between countries in a context where workers who produce intellectual property are internationally mobile (at a cost), and where innovations display some country-specificity in their usefulness or appeal. We offer two main contributions. The first is to identify some hitherto unrecognized factors affecting any country's (privately) optimal IPR policy, and the consequences of these factors for global efficiency. One such factor is what we term the *bidding-for-brains* effect. Unless innovations are truly universal, governments have an incentive to manipulate local policy to attract footloose innovators. In sharp contrast to the well known "free riding" effect, *bidding for brains* induces countries to *overprotect* intellectual property, as an outcome of a global bidding war for innovative talent.

We also identify an "expatriate brains" effect. When part (or all) of a country's intellectual workforce has departed to another country, the brain-sending country's incentives to protect intellectual property may be weakened, because the marginal innovations produced by those innovators are less relevant to the Source country when produced abroad. Thus, the 'South's' incentives to set low IPRs may both be intensified and, in part *explained by* the fact that many of the South's brains live in the North.

Our paper's second main contribution is to identify conditions in which each of the two above effects is likely to be important. We show that the expatriate brains effect tends to dominate when developing countries are small or poor: such countries have no hope of contesting the outflow of their brains via strong protection of intellectual property and instead, as predicted by the traditional IPR literature, are likely to choose zero protection in a Nash policy equilibrium. The bidding-war effect is more likely to dominate as developing countries grow in prosperity and innovative capacity to a point where their IP laws are capable of having a quantitatively significant effect on the outflows of their brains. In fact, as the South grows, we show that its Nash equilibrium IPR policy can rise from zero to levels similar to the North's, and that at this equilibrium, both countries overprotect intellectual property relative to globally efficient levels. We therefore speculate that continued development in countries like China and India might one day replace the debate over intellectual 'free-riding' by those countries with one about excessive IPR protection in a global bidding war for the world's top scientists, engineers and artists.[3]

2. Related literature

As noted, our paper contributes to two literatures, one of which examines the determination and optimality of IPR policy in a group of nations. In an early contribution to this literature, Chin and Grossman (1990) showed that low, or zero IPRs might be in the interests of developing countries, since the benefits of consuming Northern innovations at low cost override the gains to local innovators from stronger IPRs. One cost to this 'free-riding' strategy, however, is the fact that relying solely on innovations produced by the North may generate innovations that are particularly inappropriate for the South (Diwan and Rodrik, 1991).

Another cost of low Southern IPRs is the possibility that zero protection stunts the development of innovative activity in the South,

although Helpman (1993) has argued that zero Southern IPR may be optimal even in a fully dynamic model with endogenous Southern innovative capacity. Since then, Lai (1998) has shown that Helpman's result may depend on the way in which production is transferred to the South. In particular, if production is transferred via foreign direct investment rather than imitation, the South can benefit from raising its IPRs. In a similar vein, Glass and Wu (2007) show that whether strong IPRs raise Southern innovation depends also on whether innovation takes the form of improving existing products or developing new ones. Finally, Lai and Qiu (2003) show that developing countries can gain from raising their IPR protection if this is accompanied by trade concessions on other fronts by the North.

Two recent IPR papers that are closely related to ours are Grossman and Lai (2004) and Boldrin and Levine (2005), henceforth GL and BL.[4] A key question in these papers is the role of 'scale effects', which cause the optimal level of IPR protection under autarky to vary with the size of the economy. In particular, if–as BL argue empirically–optimal IPR falls (under autarky) with market size, the North's Nash equilibrium IPR protection can exceed the globally optimal level. Because our main focus is on the interactions between IPR policy and international flows of brains, our paper abstracts from scale effects.[5] Aside from this, our main departure from BL and GL's approach is to introduce international mobility of the workers who produce 'ideas'.

The earliest economics papers on brain drain (e.g. Berry and Soligo, 1969), and indeed on international factor mobility in general (e.g. Jones et al., 1986), focused on induced changes in domestic factor prices and producer surplus.[6] Although there are exceptions,[7] in most of these models factor outflows reduce the welfare of remaining residents because they reduce their opportunities to trade with differently-endowed agents. Considerations that increase the damage from brain drain include fiscal externalities stemming from the interaction of publicly-subsidized education and progressive taxation (Bhagwati and Hamada, 1974). Also, in an endogenous growth framework, some authors have argued that an outflow of skilled workers will reduce a country's growth rate (Wong and Yip, 1999).

At the same time, however, the brain drain literature has identified a number of potential benefits from skilled emigration. For example, Bhagwati and Rodriguez (1975) have proposed that emigration provides a social "safety valve" for unemployed skilled workers in less-developed countries. Other potential benefits are remittances to the home country (e.g. Ozden and Schiff, 2006), and the return migration of brains who have acquired new skills abroad. More recently, the "emigration lottery" argument (Stark et al., 1997; Mountford, 1997) has raised the possibility that foreign employment opportunities can raise the incentives to acquire education in less-developed sending countries. If enough of the newly-skilled workers stay, 'opening the exits' might ultimately raise a country's stock of human capital and growth rate (Beine et al., 2008).[8] Finally, the networks created by skilled migrants may increase beneficial exchanges of goods, factors and ideas between the home and host countries (Lopez and Schiff, 1998; Kanbur and Rapoport, 2005; Oettl and Agrawal, 2008).

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[3] We recognize, of course, that IPRs are only one of many factors affecting the location choices of scientists, engineers and artists, and that IPR policy is affected by many factors (such as the hope for additional foreign investment) other than the desire to attract scientists to one's country. Our goal, instead, is to point out interactions between IPR policy and the international migration of knowledge workers that have not, to our knowledge, been noted before, and that may have the potential to be quantitatively significant, especially as developing countries grow in market size and innovative capacity.

[4] More recent versions of BL (e.g. 2009), no longer contain Section 7, which considers the international IPR game. These results are, however, briefly described in Grossman and Lai (2006).

[5] Specifically, in BL's language and our notation, we assume that $\Psi' = 0$ where Ψ is essentially the elasticity of 'idea supply' with respect to market size. Unlike the market size effect, the direction of the new effects identified in our paper do not hinge on the sign of Ψ'.

[6] For recent reviews of the brain drain literature, see Commander et al. (2004), and Docquier and Rapoport (2009).

[7] For example, the two-good, two-factor small open economy model in which factor rewards are independent of factor endowments, and the case of large countries whose terms of trade are advantageously affected by a factor outflow.

[8] Even more recently, Bucovetsky (2003) and Haupt and Janeba (2004) have argued that the possibility of skilled emigration may impose useful discipline on the tax authorities in skilled-worker "sending" countries.