Procreation, migration and tradable quotas

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Abstract

First, we briefly discuss the very idea of tradable quotas, looking at a set of cases in which it has been proposed (but not implemented) outside the realm of pollution control and natural resources management. Next we study a proposal of tradable procreation quotas. We generalize Boulding's 1964 idea and discuss a full scheme able to deal both with under and over procreation. We then look more specifically at three effects of the scheme on income inequalities: differential productivity effect, differential fertility effect and tradability effect. Finally, we consider the migration dimension and discuss two possible schemes: (1) a domestic scheme of tradable emigration quotas among skilled people, serving as a possible alternative to a Baghwati tax (with different properties); (2) a regional or global scheme of tradable immigration quotas of unskilled workers in rich countries, serving as a "burden sharing" mechanism. Special attention is given to some conjectures regarding the impact on education and average income back in the (poor) countries of origin.

Keywords : Bhagwati tax, emission permits, Distributive effect, overpopulation, brain drain, Boulding.

JEL Classification numbers: J13, J61, F22, E61.

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Introduction

Tradable quotas (or permits) standardly aim at reducing negative externalities at the lowest possible cost.[4] They are especially suitable in such contexts of imperfectly defined and/or hard to define (downward) property rights. Air pollution provides a typical illustration, in particular when dealing with *uniformly mixed* pollutants (e.g. CO2). By the latter, we refer to pollutants such that the location (and sometimes the timing) of emissions does not affect the way the particles end up physically locating themselves in the atmosphere. For such uniformly mixed pollutants, a regulator concerned with cutting down pollution levels can perfectly replace a command-and-control tool imposing uniform targets to each of the polluting entities (typically, a plant), with a tradable quotas scheme. Uniform mixing means that there are no risks of *hot spots*, i.e. concentrations in given locations, potentially problematic for pollutants prone to threshold effects. A tradable quotas scheme thus consists in extending the legal notion of « source » geographically, shifting from a plant-based one to treating a whole area as a single source. In addition, it can also enlarge the temporal scope of the target, allowing for banking, i.e. keeping pollution permits for use at a later period.

At the level of such a larger spatio-temporal units, the pollution reduction target can remain exactly the same on aggregate as under a command-and-control regime. Yet, given the cost-reduction potential allowed for by the tradability of the pollution permits among pollution emitters, this pollution target could even be set at an increasingly low level. For if a plant requires for its production a higher set of permits than the one initially received (for the relevant period), it can buy some additional permits on a market, from other plants or firms that would not have fully used theirs. While not jeopardizing at all compliance with the global target, such a flexibility granted to each plant, by allowing it to better take into account differences in marginal abatement costs, has a clear cost-reduction effect. Not only does the scheme allow to take into account such inter-plant differences in marginal abatement costs. It simultaneously generates financial incentives for some of the plants to move below their own quota, and develop technologies to that effect. It is such incentive that will ease the pollution reduction process by leaving more room to other plants to

[4] On the difference between efficiency and cost-effectiveness: Smith and Coast. (1998 : 221).

negotiate their transition in a globally more cost-effective way. In fact, independently of its initial quota level, each polluter will have an interest in equalizing his marginal depollution cost with his gain from selling an extra permit. In short, tradable permits, by better taking into account differences in marginal reduction costs among the different emitters involved, allow for at least the same level of pollution reduction to be reached at a lesser cost, provided of course that a set of conditions are met, such as low transaction costs.[5] A common-and-control plant-focused approach would certainly be more strict with firms, which is useless whenever we are dealing with uniformly mixed pollutants. But never would it generate incentives to move significantly below the target. These are two clear (and interrelated) differences with command-and-control regulation.

Tradable permits are to be compared with another key incentive-based mode of regulation: taxation. Whereas the latter is price-focused (the quantities emitted adapting accordingly), the former is quantity-focused (the prices of quotas adapting accordingly). Both allow in their own way to take into account differences in abatement costs among the polluters involved. As with taxation, while allowing for a more efficient regulation, tradable quotas schemes equally allow to take into consideration equity issues, be it - first - in fixing the level of the global cap for the relevant region, - second - in translating this cap in quotas and allocating them on the basis of an appropriate algorithm (when an auction is not relied upon) and/or - third - in setting restrictions or not on their tradability.[6] Without claiming that tradable quotas should be systematically preferred to other modes of regulation, we will offer a preliminary account of what such proposals could entail in some respects in the field of population policy. One advantage of tradable quotas over taxes is that they require no information as to the responsiveness of households to incentives. The price of quotas will adjust to meet the objective, even if the relevant elasticities are small. Yet, there is no doubt that tradable quotas have their limitation. This is true when concern whenever there are good reasons to be concerned with hot spots. It is also the case when the number of actors or the nature of externality involved makes is very difficult to administer, when output restrictions are likely to lead to problematic effects at the input level, or when large price fluctuations occur.

[5] For reference work on tradable pollution permits : Dales (1968), Montgomery, Tietenberg (2001). For an introductory piece: Ellerman (2005).
[6] For a discussion of fairness issues in the climate change context: Gosseries (2006) .

Tradable permits schemes have been widely implemented at the domestic level (especially in the US) to deal with air pollution (see e.g. Ellerman et al., 2000 on the US Acid Rain Program), and it is now being put in place at the international level, as the Kyoto protocol illustrates. Beyond the field of pollution control, such schemes have also been implemented in the natural resources and agricultural domains, to deal with either *over-exploitation* (e.g. of fisheries or water reserves) (e.g. Davidse, 1997) or *over-production* (e.g. with milk or sugar beet quotas) (e.g. Cardwell, 1996). Interestingly enough, tradable quotas have also been proposed in a variety of other policy domains without being implemented – as far as we know. Let us mention a few of such proposals. In the field of inflation control, Lerner (1978) and Lerner and Colander (1980) designed a scheme allocating to firms tradable rights to increase wages not more than proportionally to the increase of general labour productivity. As far as of employment policy is concerned, Salais (1994) has proposed a scheme allocating to firms quotas limiting their right to « workforce adjustment », aiming at reducing *over-dismissal* and consequently the rate of unemployment.[7] In the public health field, Smith and Coast (1998) have imagined a scheme of tradable permits of antimicrobial prescription to be allocated among general practitioners in order to address the problem of growing resistance to antimicrobials resulting from their *over-prescription*. As to Casella (1999), she envisages a scheme allocating to states tradable deficit permits in order to reach in a more cost-effective way the budget deficit targets set at the European level.

This paper is part of a wider project aiming at exploring such non-conventional applications of the mechanism, assessing both its limitations and promises as precisely as possible. Here, insofar as population policy is concerned, we shall focus more specifically on procreation and migration. Surprisingly enough, one of the first tradable quotas proposals ever was actually made in this field : Boulding's (1964) proposed scheme of tradable procreation licenses to combat overpopulation. In contrast, in the migration field, with the exception of imperfect forms of tradable quota schemes in the field of asylum seekers and refugee policy (Schuck, 1997 ; Hathaway and Neve, 1997), we know of no tradable quotas proposal. In this paper, we shall thus proceed in two steps. In the field of procreation, we shall first define the problem at stake and then draw upon Boulding's

[7] For a different scheme in the employment field: Hamminga (1995).

proposal, developing our own view on the matter. We will unfold our own proposal and spell out its likely effects. In the field of migration, we shall again specify first the nature of the problem at stake. Two proposals will then be presented, conjecturing for one of them some of its effects, comparing it more specifically with a Bhagwati tax. As we go along, we will also keep an eye on parallels and differences between the schemes proposed in the procreation and the migration fields.

Before proceeding, our proposals below may rebut or shock some readers for a variety of reasons. Let us just select four among these possible worries and address very briefly each of them. *First*, tradable quotas proposals, insofar as they imply setting up markets, would be part of a *hidden deregulation agenda*. This does not need to be the case, once we consider both the fact that such proposals sometimes apply to areas that have not been regulated so far[8] and the fact that the target setting side of the scheme is as central as its market element, the latter being just a means to reaching the former in a more cost effective way. *Second*, people may conversely claim that freedom of movement with a very large geographical scope should be taken as a self-evident fundamental right. And they may equally claim that the right to procreate should remain unrestricted. There would be much to discuss about such a *fundamental rights* objection to tradable quotas. But the discussion would probably revolve around two central issues. One reason to see a right as limited simply has to do with the fact that the interests it protects may reach a point at which they are not regarded as fundamental anymore.[9] Think for example about having more than ten children or about getting the chance to visit any country in the world without restrictions. Another reason to limit the scope of rights, even when we remain within their core scope, is due to their possible conflict with other rights, with the fact that formally granting a right to all may actually make its actual enjoyment very unequal, or with the fact that other things than fundamental rights may also matter (e.g. general equal opportunity for welfare). To be sure, at a very low level, there could even be a case for a fundamental right to pollute, since even our most basic survival activities necessarily entail emissions of e.g. CO2. This does not mean that our right to pollute should have no limits, even if we were able to argue that there is a fundamental right is at work there.

[8] See Ellerman (2005 : 129) on *de novo* regulation.
[9] See e.g. on the right to procreate : Statman (2003).

The third and fourth sources of worries are quite specific to the two fields to which we propose to apply the idea of tradable quotas. One can be referred to as the *people-as-pollution* objection. In the case of pollution permits, the general public is often concerned about the very idea of allowing people to make money out of what is sometimes seen as an unconditionally bad behaviour, i.e. polluting. Conversely, how could we possibly look at immigrants or newborns, both clearly persons worthy of moral respect, through the prism of *negative externalities*? As we shall see below, defining a level at which migration and procreation may start to be seen as undesirable from the perspective of an impartial social planner is not an easy task. And it is true that e.g. the idea that immigrants are costly for their host countries is questioned to a large extent by the available evidence. Still, targets regarding socially justifiable procreation rates or migration levels could make sense, whatever the difficulties involved in setting them up. And whenever they would, they do not imply in any sense that people themselves would thereby be treated as particles of pollutants. It just means that their very *existence* (in the case of procreation) or their *movements* from one country to another (in the case of migrations) have effects on others that should be given due consideration, out of the same idea of basic respect for persons. Finally, there is a last objection that could be named the *people-as-commodities* one, that focuses on the tradability of quotas itself and what they mean. Does this tradability of quotas necessarily carry with it the idea that *people as such* should be treated as mere (tradable) goods? Not more than when we pay a worker a wage for her labour, when we ask someone for a price for a house, or when we grant subsidies to parents who decide to reproduce more than others.[10]

These are just a few developments on the host of possible reasons to be shocked about the type of proposals we will discuss below. Boulding himself, as we shall see, anticipated this type of reaction by saying that his proposal would be seen as “far fetched” and it is an interesting sociological question why people may tend to have such a reaction. One point is certain: the claim of such proposal being “unrealistic” is certainly fed in part by concerns of a normative nature that should be properly identified and considered. This means that what we are doing here is only – and necessarily so - part of the whole story.

[10] For an interesting treatment of the commodification debate : Sandel (1998).

1. Procreation[11]

Under- and over-procreation

In many countries, the actual fertility rate is viewed as inappropriate. The perception of a gap between this actual rate and what would be a better one, given the local or general circumstances, is triggered by various possible sources of concern. Typically, worries as to over-procreation are fed by the concerns as to the Earth's carrying and feeding capacity. This environmentalist/natural resourcist angle is especially vivid when it comes to the planet's global population. In contrast, other sources of concern may lead to an assessment in terms of under-procreation, this time rather at the local level. They may have to do with the relative size of various coexisting birth cohorts, threatening the financial viability of pension schemes or health care systems. This is especially true in cases of declining fertility rate or when other demographic factors (e.g. increases in life expectancy) would require an increase in fertility rate to help preserving an appropriate relative size among cohorts. Population ageing is not the only type of sources of concern for the fertility rate of a given group of people. Even if we remain within the same birth cohort, differential fertility among ethnic groups (e.g. among catholics and protestants in Northern Ireland, first generation immigrants and natives in many European capitals), or among groups with different educational achievements may also feed some people's concerns. In short, there are environmental/natural resourcist concerns mostly (but not only) as to the current global *absolute* fertility rate. And there is a whole set of reasons to worry about *relative* fertility rates, i.e. differences in fertility among birth cohorts, age groups, ethnic groups, educational groups, etc., often at a regional or local level. Yet, not all such concerns are well informed and legitimate. For example, some of the concerns for the relative fertility of coexisting ethnic groups are clearly fed by crispation on inherited privileges, if not by xenophobic motives that should be dealt with before we even consider seeing differential fertility rates as a legitimate source of concern.

[11] This section sums up in a non-mathematical way the main findings of de la Croix and Gosseries (2006). For a more comprehensive and technical treatment, the reader should report herself to that paper.

Yet, there is also a serious philosophical problem that makes it especially difficult to meaningfully set a target that should be regarded as an « optimal » population when dealing with procreation. This problem – notably identified by Parfit (1984) under the expression « repugnant conclusion » - is absent when we decide to reduce or increase fertility rates stricly out of concern for already existing people. Yet, excluding the people to come from any moral concern in this respect seems problematic. In contrast, if we are concerned about defining an optimal population not merely with reference to already existing people, but also in taking into account the welfare of the additional people that could end up arising as a result of this very choice, things become extremely tricky. Under a veil of ignorance of example, it is unclear whether a "representative individual" would prefer to take the risk of not coming to existence unless her life is of a minimal quality. To put things differently, it makes sense to consider that an action can only be bad if it negatively affects at least one person. Following this « person-affecting » intuition, and adding an impartiality requirement to it, there seems to be no reason to only look at the impact on already existing people (hence excluding future people) when asking whether a population size should be seen as optimal. If this is true, then the problem is that what we should decide *and* the beings with reference to whom we should make our choice could be *mutually dependent*. In other words, should I take into consideration the wellbeing of Paul in deciding whether I should bring Paul into existence, even if I am sure that Paul would lead a minimally decent life *and* knowing that if Paul were not to be conceived, he could not possibly be harmed? We shall not try to propose a solution to this problem here. The point is simply that defining a proper fertility rate with reference to an optimal population target taking the well-being of future people into consideration is not an easy task, and may even be an impossible one.[12] In contrast, in the migration case that will be dealt with below, such a philosophical problem does not necessarily occur since it makes perfect sense to assess migration targets merely with reference to how existing individuals are likely to fare as a result. Fixing the reference population (present *and* future people?) the well-being of which should be our focus point in deciding about procreation is thus fundamentally more challenging than deciding about the reference population (e.g. *all* our contemporaries)

[12] For a philosophical treatment of the matter : Arrhenius, 2000a and 2000b. For economic accounts: Nerlove, et al. (1989); Blackorby, et al. (1995), Golosov and Tertilt (2006), Michel and Wigniolle (2006).

when it comes to deciding about the desirability of a given migration pattern. This does not mean that defining a migration target will be devoid of other problems.

This being said, different means can be envisaged in order to reach desired fertility rates. And while taking seriously the « tradable quotas » proposal, we should definitely not endorse the narrow view according to which this tool should be adopted as an *exclusive* one at all levels to deal with over- and/or under-procreation. To name but a few alternatives, in case of under-procreation, we have had after WWII (and sometimes before) the introduction of generous family benefits, partly justified on pro-natalist grounds. Extensive (paid or unpaid) parental leave, the public provision of day care or the availability of parents-friendly workplaces are also effective in increasing fertility rates. In case of over-procreation, information campaigns and/or free availability of contraceptive means, the significant levelling up of women's education and access to the labour market (raising a.o. the age at which women get their first child). Two remarks are in order here. *First*, it is clear that fertility is the only acceptable variable on which policy-makers can play when it comes to deal with *global over-population* problems. Increasing mortality would be morally unacceptable and increasing migration would be useless. In contrast, in case of local under-population, all three key demographic variables are relevant: increasing fertility, reducing mortality, and for some of the problems listed above, increasing immigration. *Second*, in case of over-population, as means to reduce fertility become more coercive, serious concerns arise as to both their effectiveness and fairness. Fairness in this case can be understood with a twofold reference. It certainly refers to a concern for parents, given the possibly unfair restriction of their interest (and possibly right) in not being prevented from having children – with the qualifications added above.[13] Yet, it can also be child-focused, any significant sanctions on parents in case of violation of strict rules being very likely to affect their dependent children who did not choose to be born at all. One way of addressing such worries could consist in e.g. combining a tradable quotas scheme at the international level with non-coercive (and still effective) measures at the domestic level.

[13] See Sen (1996).

Taking Boulding Seriously

Let us now move to Boulding's original proposal, defended out of concern for over-population. He states it as follows (Boulding, 1964: 135-136):

> "I have only one positive suggestion to make, a proposal which now seems so far-fetched that I find it creates only amusement when I propose it. I think in all seriousness, however, that a system of marketable licenses to have children is the only one which will combine the minimum of social control necessary to the solution to this problem with a maximum of individual liberty and ethical choice. Each girl on approaching maturity would be presented with a certificate which will entitle its owner to have, say, 2. 2 children, or whatever number would ensure a reproductive rate of one. The unit of these certificates might be the "deci-child," and accumulation of ten of these units by purchase, inheritance, or gift would permit a woman in maturity to have one legal child. We would then set up a market in these units in which the rich and the philoprogenitive would purchase them from the poor, the nuns, the maiden aunts, and so on. The men perhaps could be left out of these arrangements, as it is only the fertility of women which is strictly relevant to population control. However, it may be found socially desirable to have them in the plan, in which case all children both male and female would receive, say, eleven or twelve deci-child certificates at birth or at maturity, and a woman could then accumulate these through marriage.
>
> This plan would have the traditional advantage of developing a long-run tendency toward equality in income, for the rich would have many children and become poor and the poor would have few children and become rich. The price of the certificate would of course reflect the general desire in a society to have children. Where the desire is very high the price would bee bid up; where it was low the price would also be low. Perhaps the ideal situation would be found when the price was naturally zero, in which case those who wanted children would have them without extra cost. If the price were very high the system would probably have to be supplemented by some sort of grants to enable the deserving but impecunious to have children, while cutting off the desires of the less deserving through taxation. The sheer unfamiliarity of a scheme of this kind makes it seem absurd at the moment. The fact that it seems absurd, however, is merely a reflection of the total unwillingness of mankind to face up to what is perhaps its most serious long-run problem"

Heer (1975) and Daly (1991, 1993) provide some discussion of Boulding's proposal. Tobin (1970) makes a similar one.[14] Without engaging here in a detailed discussion of each of the

[14] Let us mention here LaFollette's (1980) proposal consisting in licensing parenthood out of concern for making sure that people be able to meet the high demands of parental responsibility. His proposal leads to a restriction to freedom to procreate, with two significant differences. On the one hand, it would go against the

features of his proposal,[15] let us stress two significant ones. *First*, licenses would be allocated in principle to women only. While he envisages to make them accessible to men as well, through initial allocation, purchase, inheritance or gift, he does not envisage the possibility the state or other entities such as NGOs combating over-population, would be entitled to purchase them (see Heer, 1975 for a discussion on this). *Second*, as to the distributive dimension, Boulding conjectures which categories will buy it from which ones (the rich from the poor but also the philoprogenetive - among which the poor may be over-represented - from nuns and maiden aunts), what its effects on inequalities income would be (it would reduce them in the long run, possibly because the poor would sell part of their licenses to the rich, hence having less kids themselves, the average income within the coming generations rising accordingly) and what should be done if license prices were to rise to much (« grants to enable the deserving but impecunious to have children »).

We propose to modify and generalize Boulding's proposal. Let us first describe the model economy in which we are operating. It is populated by households differentiated by their productivity. Highly productive households (high skilled) obtain a higher wage income than the low productive workers (low skilled).[16] The households have the same preferences defined over consumption, number of children and education of these children. They have to decide how to spend their labour income, by determining how much to consume for themselves, how many children to rear, and how much education to provide to each of them. Apart from education costs, the only cost related to child rearing is an opportunity cost: the more children one has, the more time one has to spend on rearing them instead of working on the labour market.[17] For high skilled persons, the opportunity cost of having children is relatively high, compared to the cost of education. For low skilled parents, the opposite holds. As a consequence, it will turn out being optimal for high skilled parents to have fewer children but to invest more in education. This differential fertility pattern is in line with what is found in the data, both within countries, and across countries if replace households with countries. Differences in educational level have consequences in

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proposal's very spirit to make such licenses tradable. On the other hand, once the license is granted under LaFollette's scheme, there is *no limit* as to the number of kids one would be entitled to have.

[15] For further developments : de la Croix and Gosseries (2006).

[16] Note that for the purposes of this paper, we use the words « skilled » and « highly skilled » as synonyms, and « unskilled » and « low skilled » as synonyms as well.

[17] Allowing for low-skilled nannies would mitigate this effect but cannot remove it entirely.

terms of social mobility. Better educated children have a higher probability of becoming high skilled parents in the future, which allows us to address issues of inter-generational equity.

Against such a background, our twofold proposal can be summarised as follows[18]. Let us envisage here a domestic form of the proposal. A government would set for each birth cohort a fertility objective of *v* children per person. This fertility objective will be pursued through the (possibly joint) operation of permits to procreate (« allowances ») and/or permits not to procreate (« exemptions »). Coupling the two instruments (allowances dealing with over-procreation and exemptions dealing with under-procreation) gives room to more systematicity in our theoretical exploration. In practice, their simultaneous operation in a given jurisdiction allows the regulator to reach the fertility objective *strictly* (« neither less, nor more »).

We now detail the implementation sequence of procreation entitlements. Let us first consider the sequence for allowances, which are designed to prevent fertility from being above the target. At her majority, each parent receives for free (hence, not through an auction) *v* procreation permits, each of them corresponding with the right to give birth to one child. Each time she gives birth to a child, a parent has to cede one procreation allowance back to the Procreation Agency. Procreation rights can be sold and purchased at any moment in time at a market price. We now consider the sequence for exemptions, which are designed to prevent fertility from remaining below the target. Each time a parent gives birth to a child, and as soon as observed parent's fertility becomes larger than the target *v*, she will receive free of charge from the Procreation Agency one exemption right per additional child. At the standard menopausal age, each parent having less biological children than the target has to give the Procreation Agency exemptions for the difference between target and observed fertility, which she will have purchased on the procreation exemptions market. Parents with more children than the target can sell on the market the un-used exemptions. For example, if *v* were set at 1.1. child per parent, a couple would dispose of 2,2 permits to procreate. Imagine that they decide to have only one child. At the

[18] We do not discuss here in detail how to deal with complications such as how child mortality should be take into account, whether the model is able to tackle the possibility of divorce, whether it will too strongly disadvantage single parents, whether it may encourage fathers not to recognise their fatherhood in order not to have to cede back their allowances, whether cohort-specific population targets allow for less flexibility than period-based targets, what to do with women able to have children beyond standard menopausal age, etc.

latter's birth, they will cede to the state 1 allowance. At standard menopausal age, they will have had to buy 1,2 exemptions on the market. In contrast, if they end up having had three children at menopausal age, they will have had to buy on the market 0,8 extra allowances. But they will also have received from the procreation agency 0,8 tradable exemptions.

Three effects

Our concern is with the impact of introducing such a scheme on two dimensions, i.e. the income of the parents and the educational level of their children. Exploring the model allows us to identify three key effects that we shall shortly discuss below.[19] In order to emphasize the two first effects on income inequalities, we shall start with the plainest case of fixed – rather than tradable – quotas allocated on an equality per capita basis. A third effect will then become apparent as we take into consideration the tradable nature of allowances and exemptions.

The first effect we single out is labelled the « *differential productivity effect* ». Its nature can be best described as follows, restricting ourselves here to a case in which we aim at combating *over*population and assuming for a moment that both low-income and high-income people have the same fertility level (call this a « uniform fertility » world). We now introduce a population target lower than the business-as-usual fertility level. Such a target gets translated in turn through equal per capita non-tradable allowances. The fertility level of our two classes of people, i.e. the skilled (high-income) and the unskilled (low-income) will be reduced to the *same* extent. This means that both the skilled and the unskilled will increase their income as a result of the working time made available through the reduction of their number of children. However, the key fact is that while both are reducing their fertility and increasing as a result the time they spend working to the *same* extent, the hourly wage of skilled and unskilled people is *not* the same. This means that in such a uniform fertility world, the introduction of a fixed quotas scheme on a per capita basis will

[19] Here, we leave aside a fourth possible effect that occurs in case of a grandfathering-based (rather than equal per capita) initial allocation. Such an allocation is plausible in case of an inter-state scheme. Compared with the pollution control case, the initial differential fertility rate is such that the grandfathering effect, taken alone, would more redistributive than an equal per capita allocation (contrary to the pollution case in which richer people generally lead more energy-intensive lives). See de la Croix and Gosseries (2006) for further developments.

actually increase income inequalities between the unskilled and the skilled. For the income of the high income skilled people will increase relatively more than the one of low income unskilled ones.

Let us now relax the « uniform fertility » assumption and shift to a more realistic world in which unskilled people tend to have more children than skilled people. This will allow us to emphasize a second type of effect, i.e. the « *differential fertility effect* ». Given the fact that quotas are allocated on a per capita basis *and* that they are fixed, imposing our global population target will actually entail that skilled and unskilled people will have to adopt the same fertility level. Since in the business-as-usual case, skilled people have less children than unskilled people, the unskilled people will have to reduce their fertility *more* than skilled ones. This entails in turn that the unskilled will increase their working time more than the skilled people. Hence, if this were the only effect at work, introducing a fixed and equal per capita quotas regime against a background of differential fertility would tend to reduce income inequalities.

In short, in case of introducing a fixed and equal per capita quotas regime, the effect of *differential productivity* on relative *income* is such that income inequalities can be expected to *increase*. In contrast, the effect of *differential initial fertility* on relative income will tend to *reduce* income inequalities between skilled and unskilled people. Since they point in opposite directions, which one of these two effects is likely to dominate? Given our account of the background economy, the initial differential fertility will be key. If it is large, the differential fertility effect could well dominate the differential productivity effect, rendering our non-tradable quotas scheme *redistributive*. One parameter affecting the initial discrepancy between the fertility of the rich and the one of the poor is certainly the *elasticity of educational outcomes* over investment in education. If this elasticity is large, i.e. if educational outcomes tend to react significantly enough to marginal increases in educational investments, the incentive for the high skill parents to educate their children is strong, making them choosing a small number of children.

Now, a third effect on income inequalities arises from the introduction of tradability. In other words, let us imagine that we move from fixed quotas, allocated on an equal per capita basis, to a scheme allowing for the tradability of such quotas. To determine the impact of this change on inequality, it is first necessary to identify the sign of the

procreation price. The procreation price is the market value of procreation entitlements. A negative price implies that fertility is encouraged, i.e. exemptions have a positive value while allowances have none. A positive price implies that fertility is discouraged, i.e. exemptions have no value while allowances are pricely. Depending on the price of the allowances and exemptions, this effect will either tend to reduce income inequalities, or to increase them, due to the interplay of tradability with differential fertility and differential productivity. More precisely, the interesting finding is that there are actually *three* relevant zones in this respect. First, if the procreation price is negative, fertility is encouraged, which means that the unskilled will tend to have more children than the fertility target and the skilled less. Tradability will lead to rich-to-poor cash transfers in such a case, the unskilled selling their exemptions to skilled people. Second, when the procreation price is *positive and large*, the cost of having children becomes very significant. And this cost as a fraction of income is larger for the poor than for the rich, given the productivity differential. This leads to a situation in which skilled people actually have more children than the population target and the unskilled people less. The former will thus buy allowances from the latter, leading to significant rich-to-poor cash transfers. Third, there is an intermediary zone in which the price of allowances will be both *positive and small*. In such a case, the productivity differential is not sufficient to make such low prices of allowances attractive enough for the unskilled to change much their business-as-usual fertility level. Given the business-as-usual fertility differential they will thus buy allowances from skilled people, leading to poor-to-rich cash transfers, hence to an increase in income inequalities. Is this small third zone practically important ? Yes, because in case of reform aiming at reducing population, the need for political feasibility will require the fertility target to be set at a level not too distant from the actual average fertility rate. In such a case, the price of allowances is unlikely to be high. This means that, considering the tradability effect alone, a population control policy will tend, in practice, to be *anti-redistributive*. However, knowing whether this is the case once we consider the three effects examined here is a different matter.

So far, we considered three possible effects on income of introducing a tradable procreation allowances and/or exemptions scheme. A full empirical and normative assessment of the impact of such a scheme would of course require much more than that. It

would have to try and find out which of the three effects is likely to dominate under a set of assumptions. It would certainly have to figure out as well the extent to which the overall impact on income inequalities is actually relevant to analysing the scheme's impact on welfare inequalities of skilled and unskilled people. Moreover, it would also have to look at the interplay of the overall impact on income differential and of the impact on educational achievements of the next generation. On the latter, one of the situations that may occur is that with a pro-natalist policy, tradability may well reduce income inequalities within the generation of parents, while worsening the average educational level of the next generation, which could in turn increase the income inequalities between these two generations. Finally, one crucial variation would consist in setting quotas for countries rather than individuals. This would possibly allow on the one hand, to implement effective domestic policies that would not be quota-based (e.g. raising the educational level of women in poor countries) and on the other hand, relying simultaneously on a tradable quotas scheme at the inter-state level, with the hope of getting the best of both worlds.

2. Migration

Under- and over-migration

Let us now move more briefly to an exploration of the tradable quotas idea as a tool for migration policy. As in the case of procreation, it is again crucial to understand, among all the possible goals, which one the proposed scheme would be pursuing here. One may first want to reach a certain level of migration out of environmental and natural-resources oriented concerns. Both the frequency of such migratory moves and the dispersion of residences and firms they may lead to can be environmentally unfriendly. Second, migrations may raise concerns of a *cultural* nature.[20] Admittedly, they sometimes *reduce* cultural and linguistic heterogeneity (e.g. when driven by family grouping motives or when members of diasporas move back to motherland). Yet, the perception in many cases is that

[20] Such a cultural concern, beyond the ethnic one, is not absent from the procreation debate either, as part of the concern for an ageing society is certainly of a cultural nature: a society with a higher proportion of old people will certainly adopt different values than one with a different age pyramid, likely due to both age and cohort effects. Still, what is at stake in this case is not a too high diversity, but rather the reverse risk of a cohort-specific or age-specific culture dominating the others. See e.g. Hinrichs (2002).

migration *increases* local cultural and linguistic *heterogeneity*, requiring the accommodation of very different practices, the compossibility of which cannot be guaranteed a priori.

Without prejudging on the importance and (absence of) legitimacy of such environmental and cultural sources of concern for migration, let us focus here on the impact of emigration on the wealth in the countries of origin. In other words, migration targets may be set with the aim of maximizing aggregate global wealth or with the view of reducing global wealth inequalities, i.e. to improve the wealth in generally poorer countries of origin. Admittedly, there may be an economic case for concentrating certain activities involving skilled workers in certain areas of the globe.[21] This could increase aggregate global wealth. However, in the absence of a global fiscal jurisdiction, the usual tax-and-transfers channel is not available to translate such increase in global wealth into redistributive transfers. Moreover, if we were concerned about equalizing wages only, *ceteris paribus*, there could be a case for fully open borders, which would go against the idea of tradable quotas since the latter presupposes a target. Yet, there could be other reasons not to go for fully open countries (e.g. loss in human-capital-generated positive externalities, concerns for the viability of fragile democracies or of advanced social security systems). If some of these reasons to restrict free movement are legitimate, tradable quotas may be part of the second-best set of options that could serve the purpose of reducing global inequalities through the engineering of each of its three components (target, allocation of quotas, tradability)

Now, in the case of procreation, one of the options is to have a joint policy addressing both local under-procreation and global over-procreation. Here, the problem is not about operating at the local and global levels in opposite directions. Rather, it is about dealing with two sides of the same coin simultaneously, i.e. the possible under-migration of unskilled workers and the risks of over-migration of skilled workers, beyond the point at which brain drain would actually worsen the situation in the (poor) country of origin. To put it differently, although the introduction of a tradable procreation quotas scheme will definitely have an impact on the educational level of the coming generations, this does not need to be its very goal (rather than a side effect). In contrast, in the migration case, leading to a certain global distribution of skilled and unskilled people will be regarded as the

[21] See e.g. Fujita and Thisse (2002).

scheme's central goal. Moreover, in the case of procreation, we are concerned both about the global cap and the distribution of the corresponding quotas among countries. In the migration case, while e.g. environmentalists may be concerned about putting a global cap on the amount of international movements of people for a given period, we limit ourselves here to a focus on net movements of skilled and unskilled people between poor and rich countries.

More precisely, we shall adopt as a starting point the conjecture that the current level of migration of *unskilled* workers is inferior to what would be good for the countries of origin.[22] As to the levels of migration of *skilled* workers they could at some point cross the threshold of a desirable level of brain drain from the point of view of view of reducing global inequalities. The proposed scheme (or set of measures) would aim at allowing the productivity enhancing grouping of high skilled people while limiting it out of concern for the need to keep a certain proportion of skilled workers in the country of origin – a concern for a skilled/unskilled ratio to connect with the one of preserving a certain working/non-working people ratio through a tradable procreation quotas scheme. While countries experiencing ageing are mostly concerned about the shrinking proportion of workers (as opposed to children or pensioners), countries experiencing massive emigration will often be concerned about the shrinking proportion of *skilled* workers. Note before proceeding with the actual proposals that they can of course be coupled with other measures such as an increase in official development aid or the relaxation of trade barriers.

Proposal 1 : Tradable emigration permits among skilled individuals

The traditional view is that brain drain can be viewed as a threat for the country of origin, since it amounts to deprive it from its most talented citizens. Yet, a recent literature argues that, up to a certain level, brain drain is actually beneficial for the country of origin. At least three types of mechanisms underlie such a beneficial effect. First, remittances sent back to the country of origin by working emigrants constitute a non-negligible transfer.[23] Second, a real chance of emigration may have a positive impact on schooling decisions by

[22] For the view that it will also turn out being inferior to what would be good for host countries : Pritchett (2006) .
[23]See Faini (2006) and Cinar and Docquier (2004).

households. For people would be willing to increase their chances of emigration and of benefiting from a higher skill premium abroad (Beine et al., 2003). Besides deciding whether or not to invest in higher education, enhanced opportunities for skilled people to work abroad may also affect the *types* of skills in which they would invest. Mariani (2006) argues for example that increased chances of skilled migration raise the expected profits from investing in skills valued abroad, and simultaneously decreases rents from rent-seeking activities. Considering such effects, it is possible – at least in theory - to identify an emigration rate which *maximizes* some wealth, income or welfare objective for the poor country. Identifying this figure would certainly require to go beyond the mere identification of what would maximize human capital production at home, to include as well remittances, positive Diaspora externalities, etc. Note here that it may well be that brain drain is detrimental to the wealth of the (poor) country of origin only once *quite a high* threshold has been crossed (Beine and al., 2003). Let us call the former a « fair brain drain threshold ». While the non-detrimental level target could be within the range of 15% to 20% on average of the native skilled labour force, the maximizing target could in contrast possibly range from 5 to 10 % on average. Beyond this level, brain drain is likely to start having adverse effects on the country of origin. Below it, the net social return of the emigration of skilled workers remains positive on the (generally poor) country of origin, while not being as high as it could be.

So, each country of emigration would have to specify a domestic cap on annual (or quinquenial) skilled emigration. Once this "fair brain drain" cap has been identified, our first proposal consists in setting up at the domestic level, i.e. in the country of origin, a scheme of tradable emigration rights among skilled individuals only. Whether citizens would belong to such a category could be decided e.g. by reference to the fact of holding a higher education degree (or an equivalent recognition of skills). The cap would be translated in terms of number of skilled people allowed to go and work abroad over a given period. The *total* number of skilled people would be divided by the number of people that would be allowed to emigrate. This would give us the quota that each skilled citizen would be granted for a given period. For example, if the population of skilled people is 1000 – assuming counterfactually that this figure is exogenous - and only 100 of them should be allowed to leave the country, each skilled person will be granted a tradable emigration

permit of a value of 0,1. Someone willing to emigrate would thus have to buy 9 extra permits to be entitled to go and work abroad. There would be a market for such permits. Note that unskilled people would not be subject to this scheme, emigration being thus freer in their case, at least on the exit side. Among the important design issues, let us just mention the fact that one would have to decide whether the permits need to be for permanent emigration, or for temporary emigration, a possible variation that does not obtain in the procreation case (for obvious moral reasons).

How does this tradable emigration permits proposal compare with a Bhagwati tax? The latter typically consists in an *income* tax levied in/by the country *of residence* of a skilled emigrant, the proceeds of which are sent back to the country of origin (Bhagwati and Partington, 1976; Bhagwati and Hamada, 1982). In other words, it is an income tax applying abroad to one's nationals, belonging to the "global", citizenship-based, as opposed to "schedular", residence-based model of income tax.[24] Yet, what makes it special is that it would be targeted specifically at skilled workers, pursuing the specific purpose of addressing the problem of brain drain. How does this compare with tradable emigration quotas? *First*, under our proposal, the money does not need to be collected abroad. Hence it is not vulnerable to income tax paradise problems. Admittedly however, a fiscal substitute to our tradable emigration permits proposal could possibly take the form of an exit tax, i.e. be collected by the country of origin before the emigrant crosses the borders.[25] However, it would be hard to make an exit tax sensitive to the expected income in the country of immigration. This connects with a *second* difference between our proposal and the Bhagwati tax. In the tax case, the amount paid by each emigrant will fluctuate with the income received in the host country. Under our proposal, while the market price for permits will raise with the income level abroad (general equilibrium effect), the amount paid to emigrate is still not as tightly connected to people's actual income in the host country as would be the case under a progressive Bhagwati tax. *Third*, with our proposal, the level of emigration would be insensitive to the fluctuations of expected return from emigration. However, the price of permits will. *Fourth*, in principle - at least if these emigration quotas are subject to a free of charge initial allocation rather than to an auction – the money will go

[24] On this distinction (global v. schedular models of income taxation): Bhagwati (1982).
[25] For an example of exit tax : Colombo (1998).

to the pockets of skilled people only, rather than to the general budget of the state that will then decide about its destination.

Note moreover that our proposal differs significantly from Gary Becker's proposal of an entrance fee in potential countries of immigration.[26] There are at least two differences. First, as in the tax case, the fee mechanism is price-focused rather than quantity-focused. Second, the fee, given its likely uniform nature, is unlikely to translate the different national emigration optima obtaining in the countries of origin. In other words, the fee will be the same regardless of the country of origin, regardless of the fact that one country of origin would already have reached its optimal emigration target (or "fair brain drain target"), whereas another would not.

What are the likely effects of our emigration permits proposal? Let us compare them to those – well documented - of a Bhagwati tax. We first concentrate on the proposal's effect on income inequalities in the country of origin. One specific feature of the permits proposal is that they are allocated to skilled workers only, as if, in the case of a tax, the proceeds were distributed to skilled people only.[27] Hence, because of this allocation to skilled workers only, tradable permits are likely to *increase* income inequalities between skilled and unskilled, compared to a world of free movement. This is *not* the case with a Bhagwati tax, unless the proceeds were distributed in an anti-redistributive manner (which we exclude here). This is true at least if we leave aside general equilibrium effects on the wage differential via the local labour market (e.g. Bhagwati and Hamada, 1974).

A second type of effect is the one on incentives to invest in higher education. Let us suppose that the taste for migration differs among the population. When it comes to make up their mind as to whether or not to invest in higher education, those with a low taste for migration (home-loving people) are likely to stay home anyway, whatever the policy we put in place (free movement, Bhagwati tax or tradable emigration permits). In their case, the Bhagwati tax will not affect their incentive to educate themselves. This is so because this tax only affects foreign income and the proceeds are distributed independently of the skill level of recipients. In contrast, in case of permits, they only accrue to skilled workers. This raises the skill premium *at home*, which generates an incentive to educate oneself. The

[26] See his blog : http://www.becker-posner-blog.com/archives/2005/02/sell_the_right.html

[27] We concentrate on the proceeds distribution side only insofar as the effects on income inequalities are concerned, leaving aside the levying dimension.

situation is reversed once we shift from the home-loving to those having a high taste for migration (or a low mobility cost). If we abandon free movement, the skilled persons going abroad will see a reduction in their income prospect, regardless of whether we are dealing with permits or with a Bhagwati tax. For those persons, both systems reduce the incentives to get education.

These are just two effects of the proposed scheme. Many more should be looked at, including the effects on social mobility in the country of origin, the difference it makes if higher education is publicly funded or not, or the effect on incentives to education resulting from the fact that under our model, unskilled people are freer to move than skilled ones. Moreover, an assessment of the overall effect of the proposal in terms of income inequalities would be needed. This would require an assessment of the interplay between the reduction of international income inequalities pursued by the target on emigration set by the country of origin, and the likely increase in domestic income inequalities generated by the proposal. The effect on education should also be envisaged through its consequences on international income inequalities.

Proposal 2 : tradable reception duties among host countries for unskilled immigrants

The emigration of unskilled migrants may also have a beneficial effect on the (poor) countries of origin (see World Bank, 2005, pp. 64-66). Above and beyond the benefits from remittances, the mere fact of reducing the supply of unskilled labour locally, raises the wage of those who stay. Moreover, in case of non-permanent emigration, a skill-upgrade effect may result from being confronted with different work practices abroad. This skill upgrade will benefit productivity back home once the emigrant comes back to continue working at home. However, in many cases, potential host countries are reluctant to accept large numbers of such unskilled migrants. One way of increasing their access to work in rich countries could be the following. It is analogous to the way in which Hathaway and Neve (1997) and Schuck (1997) propose to deal with asylum-seekers. For a given regional area (e.g. the European Union), the current amount of immigration of unskilled workers would be assessed. This would serve as a baseline aggregate immigration level. The introduction of a tradable reception duties scheme would pursue a threefold goal. First, to

the extent that unskilled workers could be seen as a burden for host countries (which is admittedly very disputable), the initial allocation of such quotas could be done in such a way as to distribute such a "burden" in a fairer way than nowadays.[28] A possible allocation key would include e.g. population size, GDP per capita and territory size. Second, one could progressively move away from the baseline and set the number of unskilled immigrants allowed to enter, at a higher and higher level, i.e. up to the one at which such an immigration would become detrimental to the countries of origin and/or undesirable for other reasons. This clearly shows again that a tradable quotas scheme can serve the goal of increasing immigration rather than restricting it. Third, the tradability of such quotas would allow to reach a fairer burden sharing while introducing some flexibility in the system, which would tend to reduce the aggregate costs (again, if any!) of accepting a certain amount of such unskilled workers. There would be an international market on which countries would pay other people to take care of their duties in exchange for money.

Note that in the case of asylum-seekers, such a scheme, limited to reception countries, could be said to be *incomplete*. For quotas would be allocated to states that are not directly responsible for the very problem's existence (here : refugee "production"). They would thus need to be « percentage quotas » since the number of those actually seeking asylum and/or qualifying as refugee could not be fixed beforehand by the potential host countries, as the criteria on the basis of which people qualify are defined independently. In contrast, in the present proposal, there is no such a problem of incompleteness since the goal is not primarily to make sure that as little people as possible would remain unskilled and since this group of countries could freely decide on the aggregate level of unskilled immigrants that would be fair for them to accept.

Conclusion

We have emphasized all along the many differences between issues of procreation and migration. And we also stressed from the start on the fact that tradable quotas schemes have clear limitations, like any other policy mechanism. Yet, we believe that the properties of

[28] Drinkwater et al. (2003) study in detail the conditions under which the immigration of unskilled is actually beneficial to host countries.

such schemes – including the distributive ones - should be properly investigated by social scientists, including in unusual domains such as fertility control or optimal brain drain policy. At this stage, it would be premature to draw general conclusions as to the desirability of setting up such schemes, all things considered. There are a few things we would like to insist upon however.

Consider tradable procreation quotas first. One element is that an inter-state rather than a domestic regime, coupled with effective (and yet uncoercive) domestic measures such as raising women's educational level as well as their access to the labour market, may end up being politically the most promising avenue for tradable quotas in that area. Moreover, we have focused here on three effects. The signs of the initial differential fertility effect and of the productivity differential effect are opposite ones. Moreover, the tradability effect, if political feasibility constraints are taken seriously, is likely to be anti-redistributive. Its relative weight however is not totally clear. And these three effects on income inequalities will then need to be carefully connected with effects on educational levels.

Consider then the case of tradable emigration quotas. Again, there is great complexity at work here. What we can say is that significant differences with a Bhagwati tax occur at different levels. And we cannot exclude that the tradable emigration quota scheme would end up exhibiting significant strengths when compared to the Bhagwati tax proposal. In our future research, we plan to address the issues raised by tradable emigration rights and tradable reception duties within the framework of general equilibrium models.

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