Peripheral Diversity: Transfers versus Public Goods*

Klaus Desmet — *SMU and CEPR*

Ignacio Ortuño-Ortín — *UC3M*

Shlomo Weber — *SMU and NES*

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Abstract

This paper advances the hypothesis that in societies that suffer from center-periphery tension it is harder to agree on public goods than on transfers. After micro-founding a new peripheral diversity index, it puts forth a simple theory in which the cost of public goods increases with peripheral diversity and tax compliance decreases with overall diversity. It then empirically explores the relation between public goods provision, transfers, peripheral diversity and overall diversity. Consistent with the theory, we find that higher levels of peripheral diversity are associated with less provision of public goods, but more transfers, whereas higher levels of overall diversity have a negative association with transfers. Public goods and transfers are therefore substitutes in their reaction to a change in peripheral diversity.

1 Introduction

Empirical evidence has shown that countries that are linguistically more diverse exhibit lower levels of transfers; those same countries also tend to display a worse provision of public goods.[1] As argued by La Porta et al. (1999) and Alesina et al. (2003), one reason may be that in more diverse societies people are less willing to pay taxes to finance transfers and public goods. It is therefore not surprising that when analyzing the effects of linguistic diversity, public goods and transfers are often put in the same bag: both suffer from lower solidarity in more diverse societies.

Although public goods and transfers have much in common, in this paper we advance the hypothesis that politically deciding on public goods is much harder than on transfers. To illustrate

*Desmet: Department of Economics, Southern Methodist University. E-mail: kdesmet@smu.edu; Ortuño-Ortín: Department of Economics, Universidad Carlos III. E-mail: iortuno@eco.uc3m.es; Weber: Department of Economics, SMU, and New Economic School. E-mail: sweber@smu.edu.

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[1] See, e.g., La Porta et al. (1999), Alesina et al. (2003), Desmet, Ortuño-Ortín and Weber (2009), Desmet, Ortuño-Ortín and Wacziarg (2012).

this in the case of public goods, there may be disagreement over which language to use in instruction, there may be long discussions over the particular shape of the country's road network, and it may be difficult to decide on where to locate the nation's capital. In contrast, in the case of transfers, there is much less discussion over their shape or their type, because, after all, "money is money".

How does the difficulty to decide on public goods relate to a country's diversity? Casual observation suggests that the political conflict over public goods often arises from the antagonism between the minorities (the "periphery") and the dominant group (the "center"), rather than from tension between all groups. For instance, the attempt at making Hindi into India's sole national language in 1965 gave rise to widespread protests against "Hindi imperialism". This was a conflict between the periphery and the center, not between the peripheral groups themselves. The same center-periphery tension marked the 19th century policy of russification. After quelling the Polish-Lithuanian uprising against Tsarist Russia of 1863, Mikhail Muravyov, the Governor General of Lithuania, banned the use of Lithuanian, and was quoted as saying "What the Russian bayonet did not accomplish, the Russian school will". Something similar occurred in 19th century Italy, where through compulsory education and the banning of regional languages, the Northern elite was able to impose Italian as the common language (Alesina and Reich, 2015). As a last example, in present-day Spain one point of contention in the political conflict between the center and the regions is the country's star-shaped infrastructure network, with many of the roads and railroads passing through Madrid.

This discussion suggests that two types of diversity may matter in determining public goods and transfers. When it comes to people's willingness to pay taxes, it depends on a society's overall diversity, whereas when it comes to the political tension surrounding decisions on public goods, it depends on a society's tension between the center and the periphery. In the theory, we define a society's overall diversity as the expected linguistic distance between any two randomly drawn individuals — this measure is of course nothing else than Greenberg's B-index. In addition to a society's overall diversity, which derives from tension between any two individuals, we also define a society's peripheral diversity, which stems from the antagonism between the dominant group and the minorities. The main difference between both measures is that peripheral diversity ignores any potential tension between minority groups, whereas overall diversity treats all groups symmetrically.

We then propose a simple theory of the relation between peripheral diversity, overall diversity, public goods and transfers. A society is made up of individuals who belong to different linguistic groups. Their preferences are quasi-linear in public consumption and private consumption, such that any change in income is absorbed by private consumption. Public goods and transfers are financed by a proportional tax. Decisions about public goods, transfers and taxes are taken by the median voter. We then make two assumptions. First, consistent with La Porta et al. (1999) and Alesina et al. (2003), the cost of tax enforcement is increasing in society's overall diversity because of people's reduced willingness to comply. Second, consistent with the hypothesis above, the cost of public goods is increasing in society's peripheral diversity.

This simple theory yields four predictions. First, the level of public goods is decreasing in the level of peripheral diversity. This happens because an increase in peripheral diversity makes the provision of public goods more costly, leading to a drop in their provision. Second, the tax rate does not depend on society's peripheral diversity. Together with the first prediction, this implies that an increase in peripheral diversity leads to more transfers. This means that public goods and transfers are substitutes in how they react to a change in peripheral diversity. Third, the tax rate declines in the level of overall diversity. This implies that higher overall diversity lowers transfers. Fourth, because preferences are quasi-linear, a higher level of overall diversity does not affect the provision of public goods, despite its negative effect on tax revenues.

We then test these four predictions using detailed data on language use and linguistic distances from Ethnologue. These data enable us to compute measures of Greenberg's B-index and peripheral diversity for 226 countries. With these indices in hand, we analyze the relation between peripheral diversity, overall diversity, public goods and transfers in a large cross-section of countries. Consistent with the first two theoretical predictions, we find that an increase in peripheral diversity lowers the provision of public goods, but increases transfers. Consistent with the last two theoretical predictions, an increase in overall diversity has no effect on the provision of public goods, but lowers the level of transfers. Our most important conclusion is that public goods and transfers act as substitutes when the tension between the center and the periphery increases. Once again, the intuition is that the antagonism between the center and the periphery complicates political decision-making, and this disproportionately hurts public goods.

The rest paper is organized as follows. Section 2 proposes a peripheral diversity index and develops a theory of diversity, public goods and transfers. Section 3 tests the theory using cross-country data. Section 4 concludes.

2 Theory

We develop a simple theory of a society with both public goods and transfers, financed by a proportional tax. Collecting taxes is challenging, especially in diverse societies. This makes the cost of tax enforcement an increasing function of a country's linguistic diversity. Additionally, in countries with a high degree of tension between the center and the periphery, drawn-out political discussions increase the cost of providing public goods. This theory yields predictions for the relation between peripheral diversity, overall diversity, public goods and transfers. These theoretical predictions will serve as a basis for our empirical investigation. Before presenting the model, we start by proposing a framework that micro-founds a peripheral diversity index which captures the alienation that arises between the dominant center and the peripheral minority groups. An early version of this index appeared in a working paper by Desmet, Ortuño-Ortín and Weber (2005).

2.1 A General Model of Peripheral Alienation

Consider a country with total population normalized to 1. There are $K+1$ distinct groups, labeled $0, 1, \ldots, K$. One group, 0, called "center" or "dominant group", has a share s_0 of the population, whereas the other K groups, called "minorities" or "peripheral groups", have population shares s_k. Each citizen of the country belongs to one and only one group. Hence, the vector $(s_0, s_1, \ldots, s_K)$ belongs to the $k+1$-dimensional simplex Δ and $\sum_{k=0}^{K} s_k = 1$. Our model focuses on the frequently observed cases where the "dominant" group contains at least as many individuals as any of the minority groups:[2]

$$s_0 \geq \max_{k=1,\ldots,K} s_k.$$

Hence, we examine the subset of vectors $\mathcal{S} \subset \Delta$ given by:

$$\mathcal{S} = \{s = (s_0, s_1, ..., s_K) \in \Delta \mid s_0 \geq \max_{k=1,...,K} s_k\}.$$

A crucial element of our model is the introduction of ethnolinguistic distances between groups. Thus, there is a matrix T that assigns the distance τ_{kl} to each pair of groups k and l. We assume that all values τ_{kl} lie between 0 and 1, and that $\tau_{kl} = \tau_{lk}$. The set of such matrices is denoted by $\mathcal{T}$. In the empirical part of the paper we focus on linguistic distances. That is, groups

[2]There are of course cases where the dominant group does not correspond to the biggest group. Examples include the Tutsis during different periods of Rwandan history and the Afrikaners of South Africa before the end of Apartheid.

are formed by individuals who speak the same language and τ_{kl} is the linguistic distance between the language spoken by group k and the language spoken by group l.[3]

The population shares and linguistic distances will be enough to determine the level of *peripheral diversity* which reflects the tension between the center and the peripheral groups. We proceed in three steps. First, we define the notion of inter-group alienation. Second, we use this concept to define peripheral alienation. Third, we show that under certain axioms peripheral alienation can be interpreted as peripheral diversity.

We start by defining the notion of inter-group alienation. Formally, we assume there exists an alienation function such that the value of inter-group alienation experienced by group k towards group l is given by

$$f_{kl}(s_k, s_l, \tau_{kl}),$$

which depends on the size of both groups and the linguistic distance between them. Because of our focus on alienation between the center and the periphery, it is natural to allow for different functional forms, one for alienation towards the center and another for alienation towards the periphery. In particular, function $f_{pc}(s_0, s_k, \tau_{0k})$ gives the centrifugal alienation experienced by each of the $k = 1, ..., K$ minority groups towards the center, whereas the function $f_{cp}(s_0, s_k, \tau_{0k})$ gives the centripetal alienation experienced by the center towards each of the $k = 1, ..., K$ minority groups. At this point, the functions f_{pc} and f_{cp} have been constructed from the notion that alienation originates directly between groups. In the next subsection we will discuss how we can derive the functions f_{pc} and f_{cp} from an alienation function at the individual level.

The country's total level of *peripheral alienation* is then the sum of the alienation from the minority groups towards the center and from the center towards the minority groups. Formally, for every vector $s = (s_0, ..., s_K) \in \mathcal{S}$, distance matrix $T \in \mathcal{T}$ and alienation functions f_{cp} and f_{pc}, we define the total level of *peripheral alienation* $PA(s, T)$ as

$$PA(s,T) = \sum_{k=1}^{K} \left(f_{cp}(s_0, s_k, \tau_{0k}) + f_{pc}(s_0, s_k, \tau_{0k}) \right). \tag{1}$$

The following conditions introduce some more structure, and will allow us to interpret $PA(s, T)$ as a measure of *peripheral diversity.*

Condition 1 (Continuity): The functions f_{cp} and f_{pc} are continuous on $\mathcal{S}$.

[3]This is similar to the resemblance function of Greenberg (1956).

Condition 2 (Alienation is increasing in distance): For every pair k, l and every $s \in \mathcal{S}$, the functions $f_{cp}(s_0, s_k, \cdot)$ and $f_{pc}(s_0, s_k, \cdot)$ are strictly increasing on the interval $[0, 1]$.

Condition 3 (Concavity): (i) For every $s_0 \geq \frac{1}{K+1}$ and $\tau \in [0, 1]$, the function $f_{cp}(s_0, \cdot, \tau)$ is concave on the interval $[0, \min[s_0, 1 - s_0]]$; (ii) For every $s_k \leq \frac{1}{2}$ and $\tau \in [0, 1]$, the function $f_{pc}(\cdot, s_k, \tau)$ is concave on the interval $[\max[s_k, \frac{1}{k+1}], 1 - s_k]$.

Condition 4 (Supermodularity): For every $s \in \mathcal{S}$ with $s^k < s^l$, and $\tau^1 < \tau^2$, the following holds:

$$f_{cp}(s_0, s_l, \tau^1) - f_{cp}(s_0, s_k, \tau^1) < f_{cp}(s_0, s_l, \tau^2) - f_{cp}(s_0, s_k, \tau^2);$$

and

$$f_{pc}(s_0, s_l, \tau^1) - f_{pc}(s_0, s_k, \tau^1) < f_{pc}(s_0, s_l, \tau^2) - f_{pc}(s_0, s_k, \tau^2).$$

Conditions 1 and 2 impose continuity and monotonicity. Condition 3 is the key to obtain an index of diversity. If f is concave in the size of the group, smaller groups experience, in "per capita" terms, more alienation than larger groups.[4] In the case the alienation functions are differentiable, the supermodularity condition implies, in particular, that $\frac{\partial f_{cp}(s_0, s, \tau)}{\partial s \partial \tau} > 0$.

The following proposition states that peripheral alienation increases when the minority groups that are more distant from the center are larger:

Proposition 1. *Assume that Conditions 1-4 hold. Let the matrix T and the vector $\overline{s} \in \mathcal{S}$ be given. Consider the subset $\mathcal{S}_{kl}(\overline{s})$ of population shares in $\mathcal{S}$ such that $s_0 = \overline{s_0}$. Let two minority groups k, l be such that $\tau_{0k} \geq \tau_{0l}$. Suppose that the maximization problem*

$$\max_{s \in \mathcal{S}_{kl}(\overline{s})} PA(s, T)$$

has a unique solution denoted by $s^* \in \mathcal{S}_{kl}(\overline{s})$. Then $s^*_k \geq s^*_l$.

Proof. See Appendix A. □

Proposition 1 says that, if $\tau_{0k} \geq \tau_{0l}$, i.e., if group k is more distant from the center than group l, maximum peripheral alienation should satisfy $s^*_k \geq s^*_l$. Note that when $\tau_{0k} = \tau_{0l}$ the proposition implies that $s^*_k = s^*_l$. In this case, the problem resembles the traditional approach to diversity where only the sizes of the groups matter. In that context it is commonly assumed

[4] Assuming convexity, instead of concavity, would give us an index of polarization. We later return to this issue.

that an index of diversity should satisfy a property similar to the one stated in Proposition 1, namely that diversity is maximized when there is an equal number of individuals in each group. For example, Shannon's information entropy index satisfies this property (Shannon, 1949). Thus, our index $PA(s,T)$ can be interpreted as an index of *peripheral diversity*.[5] The proposition clarifies the relationship between diversity and the nature of the inter-group alienation function. Thus, whenever the functions f_{pc} and f_{cp} are concave in the size of the group, the index PA can be seen as satisfying a necessary condition to be interpreted as a *peripheral diversity* index.

At this point, one might ask what would happen if instead of Condition 3, we imposed the "opposite" condition by assuming the functions f_{cp} and f_{pc} to be *convex*. This would imply that if groups k and l have the same linguistic distance to the center, the total peripheral alienation increases if members of a smaller group join the larger one. This alternative property could be seen as a necessary condition to obtain an index of *peripheral polarization* instead of an index of peripheral diversity. Thus, depending on whether inter-group alienation increases in the size of the group in a concave way or in a convex way, the aggregate index PA can be interpreted as satisfying a necessary property of either a measure of diversity or a measure of polarization. We summarize this insight in the following corollary of Proposition 1:

Corollary 1. *Assume Conditions 1, 2 and 4 hold. Then, if Condition 3 also holds, the index of peripheral alienation, $PA(s,T)$, can be interpreted as an index of peripheral diversity, $PD(s,T)$, so*

$$PD(s,T) = PA(s,T).$$

If, however, Condition 3 does not hold, the index of peripheral alienation can be interpreted as an index of peripheral polarization.

2.2 A Specific Index of Peripheral Alienation

In this section we provide a specific form for the inter-group alienation functions f_{pc} and f_{cp}. These functions will be the ones used in the empirical part. In contrast to our approach in the previous section, we derive them from assumptions at the individual level.

[5] Notice that Condition 3 requires concavity of the function $f_{cp}(s_0, \cdot, \tau)$. Thus, this concavity, together with the other conditions, is sufficient to obtain that the solution to the maximization problem stated in the proposition is given by $s_k^* \geq s_l^*$. However, concavity of $f_{cp}(s_0, \cdot, \tau)$ is not a necessary condition to obtain the solution. For example, if the function $f_{pc}(\cdot, s_k, \tau)$ is "sufficiently" concave, the function $f_{cp}(s_0, \cdot, \tau)$ need not be concave.

To come up with these functions, we follow the identification-alienation framework of Esteban and Ray (1994), though we will allow for a more flexible approach.[6] An individual who speaks language k feels identified with other individuals who speak the same language. This sense of identification is a function of the size of the group, and is represented by s_k^α. In Esteban and Ray (1994) α is positive, implying that the sense of identification is stronger the bigger the group. In contrast, we prefer not to restrict the value of α. Indeed, it may very well be that the sense of identification becomes smaller as the group becomes larger, in which case $\alpha < 0$. There are many examples where small linguistic, cultural or religious groups feel a keener sense of community and a stronger desire to assert their identity.

An agent speaking language k feels more alienated from someone speaking language l the greater the distance τ_{kl}. This alienation is influenced by the sense of identification. In particular, an individual attaches more weight to the distance τ_{kl} if his sense of identification is stronger. As defined in Esteban and Ray (1994), the alienation between an individual speaking language k and an individual speaking language l is $s_k^\alpha \tau_{kl}$. Since there is a proportion s_0 of individuals speaking the dominant language, the centrifugal alienation of an agent speaking minority language k is $s_0^\beta s_k^\alpha \tau_{0k}$. In Esteban and Ray (1994), $\beta = 1$. In our case, we suppose that an individual's centrifugal alienation only depends on there being an official or dominant language, independently of how many people actually speak that dominant language, so that we set $\beta = 0$. In that case, an individual's centrifugal alienation is $s_k^\alpha \tau_{0k}$. Setting $\beta = 0$ captures the idea that some policy choices may be imposed by the center because of it being the center and not because of its exact size. If so, it is reasonable to think that the centrifugal alienation associated with these policies are independent of the center's exact size. If each individual speaking minority language k feels an alienation $s_k^\alpha \tau_{0k}$ towards the center, and if a share s_k of the population speaks language k, then the centrifugal alienation of all speakers of language k is $s_k^{1+\alpha} \tau_{0k}$. Thus, the inter-group alienation function f_{pc} is given by

$$f_{pc}(s_0, s_k, \tau_{0k}) \equiv s_k^{1+\alpha} \tau_{0k}. \tag{2}$$

We assume that individuals of the center have the same type of alienation function as individuals of the minority groups, except for the fact that in this case β is set to 1. There is no

[6] For a similar approach used to derive a variety of indices — Greenberg's A index, Greenberg's B index, Esteban and Ray's (1994) polarization index, Reynal-Querol's (2002) polarization index and a simple version of the peripheral index — see Desmet, Ortuño-Ortín and Weber (2009).

reason why the alienation experienced by the center towards the periphery should be independent of the peripheral groups' sizes. Hence, the centripetal alienation felt by members of the central group depends on the size of the minorities, so that

$$f_{cp}(s_0, s_k, \tau_{0k}) \equiv s_k s_0^{1+\alpha} \tau_{0k}. \tag{3}$$

We can now define the total level of *peripheral alienation* by plugging (2) and (3) into (1):

$$\begin{aligned} PA(s,T) &= \sum_{k=1}^{K} (f_{pc}(s_0, s_k, \tau_{0k}) + f_{cp}(s_0, s_k, \tau_{0k})) \\ &= \sum_{k=1}^{K} (s_k^{1+\alpha} \tau_{0k} + s_k s_0^{1+\alpha} \tau_{0k}) \end{aligned} \tag{4}$$

This is the index we will be using in the empirical section of the paper. Depending on the value of α, (4) can be interpreted as an index of *peripheral diversity* or an index of *peripheral polarization*. We summarize this result in the following corollary:

Corollary 2. *If $\alpha < 0$, the index (4) satisfies Conditions 1, 2, 3 and 4, and can thus be viewed as an index of peripheral diversity. Hence,*

$$PD(s,T) = PA(s,T) = \sum_{k=1}^{K} (s_k^{1+\alpha} \tau_{0k} + s_k s_0^{1+\alpha} \tau_{0k}) \text{ if } \alpha < 0$$

If, in contrast, $\alpha > 0$, the index (4) can be interpreted as an index of peripheral polarization.

To illustrate the difference between diversity and polarization, consider a country with three linguistic groups. Their respective sizes are s_0, s_1 and s_2. Language 0 is the dominant language, and languages 1 and 2 are the minority languages. Further assume that the distance between each minority language and the dominant language is 1. Index (4) is then equal to $s_1 s_0^{1+\alpha} + s_2 s_0^{1+\alpha} + s_1^{1+\alpha} + s_2^{1+\alpha}$. We can now interpret this example for the two cases we have in mind. If $\alpha < 0$, we get a measure reflecting diversity. For a given share of the dominant language, the maximum diversity is reached when $s_1 = s_2$. In other words, we face most diversity with two (equally sized) minority languages. If $\alpha > 0$, we obtain a measure reflecting polarization that attains the highest level if one of the two remaining languages disappears. In other words, the level of polarization is highest if we have only one, rather than two, minority languages. This insight does not change once we allow for different distances between languages.

2.3 Peripheral Diversity, Public Goods and Transfers

Denote the income of individual i by y_i. Average income is y, and median income is y_m, where $y_m < y$. The government provides everyone with the same level of public goods and lump-sum transfers. All individuals have the same preferences over public consumption (G) and private consumption (c), represented by the quasi-linear utility function

$$u(G, c) = 2G^{1/2} + c.$$

The government pays for public goods and transfers through a proportional tax. The cost of public goods is increasing in the political conflict incurred to reach an agreement. Our discussion in the introduction suggests that this political conflict often has a markedly center-periphery character. For example, the center and the periphery may have long drawn-out discussions about which language to use in schools and hospitals, or it may take many fights for both sides to agree on the shape of the country's road network. We therefore postulate that the cost of the public goods is proportional to the tension individuals from the periphery feel towards the center, $\sum_{k=1}^{K} s^{1+\alpha}\tau_{0k}$, and the tension individuals from the center feel towards the periphery, $\sum_{k=1}^{K} s_k s_0^{1+\alpha}\tau_{0k}$. That is, the cost of the public good, p, is an increasing function of the peripheral index, PD; for simplicity, we assume that $p = PD$.

Collecting taxes is challenging in diverse societies. We assume that the cost of tax enforcement is an increasing function of the average linguistic distance between individuals in society, $\sum_k \sum_l s_l s_k d_{lk}$. This captures the idea in La Porta et al. (1999) and Alesina et al. (2003) that people are less tax compliant in more diverse societies. In addition, the cost of tax enforcement is assumed to be increasing in the tax rate, t. Hence, a tax rate t will generate government income $ty(1 - \gamma t \sum_k \sum_l s_l s_k d_{lk})$, where $\gamma > 0$ and $\gamma \sum_k \sum_l s_l s_k d_{lk} < 1$. Notice that $\sum_k \sum_l s_l s_k d_{lk}$ is nothing else than Greenberg's B-index, which measures the average linguistic distance between two randomly picked individuals. Hence, $B = \sum_k \sum_l s_l s_k d_{lk}$. The society's budget constraint can then be written as

$$(PD)G + r = ty(1 - \gamma tB).$$

The society has to choose the level of public good, G, the income tax rate, t, and the transfer that each individual receives, r. The optimal policy (G, t, r) for an individual with income $y_i < y$

is the outcome of the following optimization problem

$$\max_{G,t,r} \quad 2G^{1/2} + (1-t)y_i + r$$
$$s.t. \quad (PD)G + r = ty(1-\gamma tB)$$
$$0 \leq t \leq 1.$$

The first order conditions for an interior solution of this problem yield

$$G = \left(\frac{1}{PD}\right)^2 \tag{5}$$
$$t = \frac{y - y_i}{2\gamma By} \tag{6}$$
$$r = -(PD)G + ty(1 - t\gamma B). \tag{7}$$

Note that condition $t \leq 1$ implies that an interior solution satisfies

$$\frac{y - y_i}{y} \leq 2\gamma B$$

and that the level of public good G does not depend on the tax rate t. Furthermore, equations (5) and (7) imply that

$$r = ty(1 - t\gamma B) - \frac{1}{PD} \tag{8}$$

so that for a given tax rate t all individuals agree on the optimal level of transfers r. Thus, the tax rate t is the only variable to be determined. We can write the corresponding indirect utility function as

$$v(t; y_i) = \frac{1}{PD} + (1-t)y_i + ty(1 - t\gamma B).$$

We assume that (G, t, r) coincides with the ideal policy of a median voter. Since the optimal tax rate t is a decreasing function of y_i and $\frac{\partial^2 v(t;y_i)}{\partial t^2} = -\gamma By < 0$, existence of a median voter is guaranteed. That median voter coincides with the individual who has the median income y_m.

From (5) it is obvious that

$$\frac{dG}{dPD} < 0 \text{ and } \frac{dG}{dB} = 0. \tag{9}$$

Combining (6) and (8), for the median income agent we can write

$$r = -\frac{1}{PD} + \left(\frac{y - y_m}{4\gamma B}\right)\left(1 + \frac{y_m}{y}\right). \tag{10}$$

Given that $y_m < y$, from (10) it follows that

$$\frac{dr}{dPD} > 0 \text{ and } \frac{dr}{dB} < 0. \tag{11}$$

Before turning to the empirics, it is useful to provide some intuition for our findings in (9) and (11). When peripheral diversity increases, the cost of public goods goes up, but the cost of enforcing taxes does not change. As a result, the drop in public goods provision, due to its higher price, is compensated by an increase in transfers. When, instead, overall diversity goes up, collecting taxes becomes more expensive. The quasi-linear nature of the preference function then implies that the provision of public goods does not change, so that the lower tax revenues must entail a lower level of transfers.

3 Empirical Analysis

In our empirical analysis we explore the relation between peripheral diversity, overall diversity, public goods provision and redistribution through transfers. In particular, we test whether greater peripheral diversity is associated with worse public goods provision, but higher levels of transfers. We also test whether higher overall diversity is associated with lower transfers. Before doing so, we discuss how to measure linguistic distances and which parameter values to use to measure peripheral diversity (4).

3.1 Linguistic Distances and Parameter Values

Using language trees, Fearon (2003) and Desmet, Ortuño-Ortín and Weber (2009) measure the distance between languages l and k as:

$$\tau_{lk} = 1 - (\frac{b_{lk}}{m})^{\delta} \tag{12}$$

where b_{lk} is the number of shared branches between l and k, m is the maximum number of branches between any two languages, and δ is a parameter that determines how fast the distance declines as the number of shared branches increases. Data on language trees come from the Ethnologue project (Gordon, 2005). The parameter δ determines the curvature of the distance function. Lower values of δ imply a more convex function, meaning that linguistic distances only become important when two languages are sufficiently apart. Fearon (2003) uses a value of $\delta = 0.5$, whereas Desmet, Ortuño-Ortín and Weber (2009) use a value of $\delta = 0.05$ in the case of transfers. Since our interest goes beyond transfers and includes public goods, we use the more standard Fearon value of $\delta = 0.5$ as our benchmark, but explore other values in our robustness checks. As for the value of α, our focus is on peripheral diversity, rather than peripheral polarization. We therefore choose a value of $\alpha = -0.5$.

3.2 Peripheral Diversity and Greenberg's B-Index

Using data from Ethnologue (Gordon, 2005), Table A.1 shows the values of peripheral diversity ($\alpha = -0.5$ and $\delta = 0.5$) and Greenberg's B-Index ($\delta = 0.5$) for 226 countries. The correlation between the two indices is 0.73. Though high, it is enough to introduce notable differences between both. Some countries have a relatively high degree of peripheral diversity, but a relatively low degree of overall diversity. For example, Mexico ranks 22 in terms of peripheral diversity, but only 153 in terms of Greenberg's B-index. Likewise, Russia ranks 38 in terms of peripheral diversity, but 117 in terms of Greenberg's B-index. Some countries exhibit the opposite pattern, with relatively low degrees of peripheral diversity, in spite of having relatively high levels of Greenberg's B-index. Examples include Belize and Bolivia.

3.3 Public Goods, Peripheral Diversity and Greenberg's B-Index

Table 1 reports our benchmark regression of public goods on Greenberg's B-index and peripheral diversity. To give a broad overview of different public goods, we include two related to health (child mortality and measles immunization), two related to education (illiteracy and school attainment) and two related to infrastructure (access to improved sanitation and road density). In addition to our variables of interest, we also control for GDP per capita, regional dummies, absolute latitude and roughness of terrain. In general the data cover the period 1990-2010. Appendix B provides a detailed description of the data sources and their time spans. As expected, Table 1 shows that, whenever statistically significant, income per capita and distance from the equator (absolute latitude) improve public goods outcomes, whereas roughness of terrain worsens them. As for the regional dummies, sub-Saharan Africa fares worst.

Turning to our two variables of interest, we find that peripheral diversity tends to worsen outcomes. In all but two of the cases, the effect is statistically significant at the 5% level. In one of the remaining cases — school attainment — the effect is still statistically significant at the 10% level, whereas in the other case — road density — the effect is statistically insignificant. As for

Greenberg's B-index, its effect is statistically insignificant. These results are in line with our theory: as shown by (9) and (11), a higher degree of peripheral diversity worsens the provision of public goods, whereas a greater level of overall diversity has no effect.

In terms of its economic effects, peripheral diversity is by no means trivial. The standardized β values on peripheral diversity range from 7% in the case of child mortality to -31% in the case of measles immunization. This means that a one standard deviation increase in peripheral diversity increases child mortality by 7% of its standard deviation, and it lowers the measles immunization rate by 31% of its standard deviation. To put these numbers in context, in the case of child mortality, a one standard deviation increase in peripheral diversity has about one-tenth of the effect of a one standard deviation decrease in GDP per capita. In contrast, in the case of measles immunization, a one standard deviation increase in peripheral diversity has a larger effect than a one standard deviation decrease in GDP per capita.

We now perform three types of robustness checks. First, we run the same regressions, but include a broader set of regressors. In particular, we add legal origin and religious composition. As can be seen in Table 2, our findings are unchanged. Second, we include Greenberg and peripheral diversity separately. Table 3 reports the results. When only including Greenberg's B-index (Panel A), its effect tends to worsen public goods. Two out of the six outcomes yield coefficients that are statistically significant at the 1% level, two other outcomes give coefficients that are statistically significant at the 10% level, and the remaining two are not significant. When only including peripheral diversity (Panel B), its effect also tends to worsen public goods. Four out of the six outcomes give coefficients that are statistically significant at the 1% level, one other at the 10% level, and the remaining one is not significant. It is not surprising that when including Greenberg's B-index and PD separately, both tend to be negatively associated with outcomes. After all, Greenberg's B-index and PD are positively correlated. Note, furthermore, that the R^2 values tend to be slightly higher for the regressions that include PD than for those that include Greenberg's B-index. Hence, not surprisingly, when both are jointly included, as in Table 1, PD trumps Greenberg's B-index. Third, we look at different values of δ. Recall that lower values of δ imply that linguistic distances only become important when two languages have only few branches in common. Table 4 reports results for $\delta = 0.1$ (Panel A) and $\delta = 0.9$ (Panel B). The results do not change much: the lower value of δ gives slightly more significant results for PD than the higher value of δ, but the difference is small.

3.4 Transfers, Peripheral Diversity and Greenberg's B-Index

We now turn to analyzing the relation between peripheral diversity, Greenberg's B-index and transfers. Our dependent variable is transfers & subsidies as a share of GDP.[7] As in the case of public goods, the data cover the period 1990-2000. Table 5 reports the results. In column (1), where we control for GDP per capita, latitude, roughness of terrain and regional dummies, we find that transfers tend to go down when Greenberg's B-index increases. In contrast, transfers tend to increase when peripheral diversity is higher. Both coefficients are statistically significant at the 1% level. These findings are consistent with our theoretical results (9) and (11). The rest of the columns of Table 5 analyze the robustness of our findings by including different sets of controls, such as population size, legal origin, religious composition, and share of the population 65 years and older. Our results are unchanged.

The magnitudes of the effects are economically meaningful. Focusing on column (3), the standardized β on peripheral diversity is 15%, and the standardized β on Greenberg's B-index is -25%. This means that a one standard deviation increase in peripheral diversity raises transfers by 15% of its standard deviation, whereas a one standard deviation increase in Greenberg's B-index lowers transfers by 25% of its standard deviation. To put these figures into context, a one standard increase in GDP per capita raises transfers by 53% of its standard deviation. Hence, the roles of peripheral diversity and Greenberg's B-index are quantitatively relevant.

We run two further robustness checks. First, we include Greenberg's B-index and peripheral diversity as two separate regressors. For each case, we rerun the regressions of column (1) and column (6) of Table 5. The results can be seen in Table 6. Results are weaker, and most often statistically insignificant. This is not surprising: since Greenberg's B-index and peripheral diversity are positively correlated, but have opposite effects when included jointly, their effects when included separately are ambiguous. Second, we analyze how our results change when we take different values of δ. Table 7 reports the results. Our findings are largely unchanged, though somewhat weaker for low values of δ.

[7] In the text we refer to the variable as simply "transfers" but there is a difference between both: if the beneficiary is an individual, it is a "transfer"; if the beneficiary is a business, it is a 'subsidy." The data do not allow us to look at transfers separately (Desmet, Ortuño-Ortín and Weber, 2009).

4 Concluding Remarks

In this paper we have proposed a theory that analyzes the relation between diversity, public goods and transfers. Following the existing literature, the theory assumes that people are less willing to pay taxes in countries with high degrees of overall diversity. In addition to this standard argument, we have advanced the hypothesis that in countries that suffer from greater antagonism between the center and the periphery it is harder to reach a political agreement on public goods than on transfers. To distinguish between these two arguments, we have defined two types of diversity: a country's overall diversity which captures the tension between all individuals and affects the willingness to pay taxes; and a country's peripheral diversity which captures the tension between the center and the periphery and affects the cost of providing public goods.

Our simple theory has yielded four predictions: greater peripheral diversity lowers public goods provision but increases transfers, whereas greater overall diversity has no effect on public goods provision but lowers transfers. Our empirical analysis has provided evidence in support of these theoretical predictions. An important conclusion is that public goods and transfers are substitutes in their relation to a change in peripheral diversity.

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Table 1 – Public Goods, Greenberg's B-Index and Peripheral Diversity

	(1) Log Child Mortality	(2) Measle Immunization Rate	(3) Illiteracy Rate	(4) Log School Attainment	(5) % Access to Sanitation	(6) Roads (km per 1,000 population)
Greenberg's B-Index	**0.174**	**-2.645**	**2.471**	**0.104**	**6.471**	**-1.051**
	[0.90]	**[-0.50]**	**[0.36]**	**[0.73]**	**[0.82]**	**[-0.26]**
Peripheral Diversity	**0.043****	**-2.663*****	**1.518****	**-0.024***	**-3.291*****	**0.492**
	[2.59]	**[-3.53]**	**[2.42]**	**[-1.94]**	**[-4.31]**	**[1.47]**
Log GDP per Capita (1990-2000)	-0.480***	2.537***	-6.126***	0.140***	10.754***	2.358***
	[-16.57]	[3.08]	[-6.46]	[7.04]	[9.09]	[5.21]
Absolute latitude	-0.010***	0.072	-0.449***	0.007***	0.110	0.198**
	[-2.68]	[1.04]	[-3.91]	[2.65]	[0.83]	[2.57]
Terrain Roughness	-0.267*	0.143	-14.866***	0.253	3.959	-3.956*
	[-1.96]	[0.03]	[-2.65]	[1.20]	[0.58]	[-1.90]
Latin America and Carribean	-0.001	1.922	-8.813**	0.168*	-3.757	1.879
	[-0.01]	[0.75]	[-2.24]	[1.68]	[-0.81]	[0.88]
Sub-Saharan Africa	0.493***	-10.663***	3.580	-0.070	-25.352***	3.394
	[3.61]	[-3.50]	[0.78]	[-0.60]	[-4.88]	[1.59]
East and Southeast Asia	-0.437***	3.667	-16.050***	0.129	-2.985	-1.809
	[-2.82]	[0.97]	[-3.59]	[1.44]	[-0.50]	[-0.73]
Constant	7.393***	67.122***	79.036***	0.592***	-9.663	-17.073***
	[26.18]	[9.11]	[7.56]	[2.71]	[-0.83]	[-3.93]
Observations	171	171	140	137	172	172
R-squared	0.8852	0.5457	0.6176	0.6365	0.7804	0.3892

Robust t-statistics in brackets. *** p < 0.01, ** p < 0.05, * p < 0.1

Table 2 – Public Goods, Greenberg's B-Index and Peripheral Diversity (Broader Specification)

	(1) Log Child Mortality	(2) Measle Immunization Rate	(3) Illiteracy Rate	(4) Log School Attainment	(5) % Access to Sanitation	(6) Roads (km per 1,000 population)
Greenberg's B-Index	**0.098** **[0.51]**	**-6.335** **[-1.34]**	**-1.448** **[-0.22]**	**0.179** **[1.46]**	**0.661** **[0.09]**	**2.563** **[0.60]**
Peripheral Diversity	**0.041*** **[1.93]**	**-2.220***** **[-3.03]**	**2.036***** **[2.70]**	**-0.033**** **[-2.25]**	**-2.137**** **[-2.45]**	**-0.252** **[-0.62]**
Log GDP per Capita (1990-2000)	-0.474*** [-12.74]	3.800*** [3.90]	-6.887*** [-7.43]	0.163*** [8.13]	13.661*** [9.92]	1.690*** [4.17]
Absolute latitude	-0.005 [-0.99]	0.001 [0.01]	0.053 [0.40]	-0.000 [-0.04]	0.015 [0.09]	0.126 [1.54]
Terrain Roughness	-0.164 [-1.24]	1.683 [0.39]	-13.387*** [-2.94]	0.210 [1.12]	5.462 [0.77]	-3.379 [-1.58]
Latin America and Carribean	0.183 [1.31]	3.923 [1.34]	-0.021 [-0.01]	0.047 [0.48]	2.616 [0.47]	-1.379 [-0.59]
Sub-Saharan Africa	0.645*** [4.69]	-7.257** [-2.21]	9.575** [2.26]	-0.193* [-1.74]	-16.469*** [-2.80]	0.311 [0.16]
East and Southeast Asia	-0.170 [-0.95]	2.514 [0.60]	-4.208 [-0.78]	-0.109 [-0.92]	-2.958 [-0.39]	-1.187 [-0.45]
Socialist legal origin	0.017 [0.11]	2.939 [0.85]	-17.609*** [-4.01]	0.233*** [2.86]	14.770*** [3.11]	0.231 [0.11]
French legal origin	0.063 [0.82]	-7.043*** [-2.90]	4.250 [1.32]	-0.143*** [-2.84]	-0.398 [-0.12]	-0.820 [-0.62]
German legal origin	-0.128 [-1.10]	-13.565*** [-3.01]		-0.075 [-0.64]	-1.189 [-0.22]	-6.975** [-2.36]
Scandinavian legal origin	-0.551*** [-2.74]	-0.182 [-0.04]		-0.275*** [-2.66]	-0.286 [-0.06]	2.235 [0.21]
Share of Protestants	0.006** [2.42]	-0.063 [-1.24]	-0.205** [-2.13]	0.002 [1.22]	-0.084 [-0.99]	0.127* [1.86]
Share of Roman Catholics	0.001 [0.55]	-0.013 [-0.37]	-0.084 [-1.61]	-0.000 [-0.42]	-0.007 [-0.14]	0.021 [1.05]
Share of Muslims	0.005*** [3.50]	0.001 [0.03]	0.028 [0.64]	-0.003** [-2.51]	0.092 [1.62]	-0.017 [-0.96]
Constant	6.898*** [20.60]	61.817*** [7.46]	73.975*** [7.58]	0.776*** [3.18]	-37.642*** [-2.62]	-9.986** [-2.52]
Observations	169	169	138	136	170	170
R-squared	0.9022	0.6141	0.7308	0.7827	0.8071	0.5007

Robust t-statistics in brackets. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 3 – Public Goods: Greenberg's B-Index and Peripheral Diversity Separately

Panel A: Greenberg's B-Index

	(1) Log Child Mortality	(2) Measle Immunization Rate	(3) Illiteracy Rate	(4) Log School Attainment	(5) % Access to Sanitation	(6) Roads (km per 1,000 population)
Greenberg's B-Index	**0.410*** [2.68]**	**-17.192*** [-3.67]**	**11.002* [1.85]**	**-0.027 [-0.23]**	**-11.616* [-1.71]**	**1.665 [0.58]**
Log GDP per Capita (1990-2000)	-0.484*** [-16.61]	2.765*** [3.35]	-6.361*** [-6.84]	0.142*** [7.36]	10.980*** [9.15]	2.321*** [5.18]
Absolute latitude	-0.010*** [-2.70]	0.080 [1.07]	-0.458*** [-3.92]	0.008*** [2.69]	0.128 [0.95]	0.196** [2.54]
Terrain Roughness	-0.264* [-1.91]	-0.061 [-0.01]	-14.387** [-2.51]	0.228 [1.06]	3.586 [0.52]	-3.907* [-1.89]
Latin America and Carribean	0.003 [0.03]	1.648 [0.62]	-8.601** [-2.15]	0.168* [1.66]	-3.862 [-0.83]	1.915 [0.90]
Sub-Saharan Africa	0.499*** [3.63]	-11.051*** [-3.47]	3.626 [0.78]	-0.075 [-0.64]	-25.697*** [-4.87]	3.452 [1.62]
East and Southeast Asia	-0.374** [-2.45]	-0.216 [-0.06]	-13.639*** [-2.97]	0.096 [1.01]	-8.050 [-1.31]	-1.112 [-0.47]
Constant	7.415*** [26.19]	65.786*** [8.96]	80.519*** [7.72]	0.583*** [2.70]	-11.118 [-0.94]	-16.850*** [-3.87]
Observations	171	171	140	137	172	172
R-squared	0.8831	0.5046	0.6090	0.6319	0.7656	0.3847

Robust t-statistics in brackets. *** p < 0.01, ** p < 0.05, * p < 0.1

Panel B: Peripheral Diversity

	(1) Log Child Mortality	(2) Measle Immunization Rate	(3) Illiteracy Rate	(4) Log School Attainment	(5) % Access to Sanitation	(6) Roads (km per 1,000 population)
Peripheral Diversity	**0.057*** [4.05]**	**-2.876*** [-4.55]**	**1.708*** [3.13]**	**-0.016 [-1.42]**	**-2.763*** [-4.40]**	**0.407* [1.81]**
Log GDP per Capita (1990-2000)	-0.481*** [-16.72]	2.553*** [3.08]	-6.126*** [-6.51]	0.140*** [7.09]	10.719*** [9.04]	2.365*** [5.16]
Absolute latitude	-0.011*** [-2.83]	0.079 [1.19]	-0.456*** [-4.10]	0.007*** [2.64]	0.096 [0.75]	0.201*** [2.68]
Terrain Roughness	-0.288** [-2.18]	0.471 [0.11]	-15.212*** [-2.79]	0.239 [1.13]	3.155 [0.48]	-3.826* [-1.95]
Latin America and Carribean	-0.025 [-0.20]	2.288 [0.89]	-9.148** [-2.49]	0.154 [1.59]	-4.637 [-1.06]	2.025 [1.04]
Sub-Saharan Africa	0.482*** [3.56]	-10.490*** [-3.43]	3.421 [0.76]	-0.076 [-0.66]	-25.769*** [-5.01]	3.464* [1.69]
East and Southeast Asia	-0.461*** [-3.15]	4.026 [1.07]	-16.356*** [-3.68]	0.116 [1.32]	-3.944 [-0.67]	-1.665 [-0.71]
Constant	7.457*** [27.99]	66.147*** [8.76]	79.879*** [7.78]	0.625*** [2.84]	-7.332 [-0.66]	-17.463*** [-4.22]
Observations	171	171	140	137	172	172
R-squared	0.8847	0.5451	0.6172	0.6353	0.7796	0.3889

Robust t-statistics in brackets. *** p < 0.01, ** p < 0.05, * p < 0.1

Table 4 – Public Goods and Diversity: Robustness Linguistic Distances

Panel A: δ=0.1

	(1) Log Child Mortality	(2) Measle Immunization Rate	(3) Illiteracy Rate	(4) Log School Attainment	(5) % Access to Sanitation	(6) Roads (km per 1,000 population)
Greenberg's B-Index (δ=0.1)	**0.12** **[0.53]**	**1.947** **[0.34]**	**-10.657** **[-1.31]**	**0.27** **[1.64]**	**14.27** **[1.54]**	**-0.633** **[-0.13]**
Peripheral Diversity (δ=0.1)	**0.059**** **[2.42]**	**-3.190***** **[-4.20]**	**2.569***** **[2.75]**	**-0.041**** **[-2.40]**	**-3.870***** **[-3.94]**	**0.552** **[1.21]**
Observations	171	171	140	137	172	172
R-squared	0.885	0.5235	0.6142	0.6408	0.7748	0.389

Robust t-statistics in brackets. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$
Regression include following additional controls: log GDP per capita (1990-2000), absolute latitude, terrain roughness, Latin America and Caribbean dummy, sub-Saharan Africa dummy and East and Southeast Asia dummy.

Panel B: δ=0.9

	(1) Log Child Mortality	(2) Measle Immunization Rate	(3) Illiteracy Rate	(4) Log School Attainment	(5) % Access to Sanitation	(6) Roads (km per 1,000 population)
Greenberg's B-Index (δ=0.9)	**0.196** **[1.12]**	**-3.585** **[-0.73]**	**5.984** **[0.95]**	**0.045** **[0.34]**	**2.828** **[0.39]**	**-1.267** **[-0.35]**
Peripheral Diversity (δ=0.9)	**0.035**** **[2.42]**	**-2.340***** **[-3.46]**	**1.065*** **[1.83]**	**-0.017** **[-1.47]**	**-2.888***** **[-3.99]**	**0.45** **[1.55]**
Observations	171	171	140	137	172	172
R-squared	0.8852	0.5492	0.6186	0.6353	0.7827	0.389

Robust t-statistics in brackets. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$
Regression include following additional controls: log GDP per capita (1990-2000), absolute latitude, terrain roughness, Latin America and Caribbean dummy, sub-Saharan Africa dummy and East and Southeast Asia dummy.

Table 5 – Transfers, Greenberg's B-Index and Peripheral Diversity

Dependent Variable: Transfers 1990-2010	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Greenberg's B-Index	**-9.769*** [-4.36]**	**-8.742*** [-3.70]**	**-8.657*** [-3.65]**	**-5.810*** [-2.75]**	**-5.696** [-2.55]**	**-4.880** [-2.29]**
Peripheral Diversity	**0.625*** [3.87]**	**0.510*** [2.85]**	**0.591*** [2.94]**	**0.461** [2.08]**	**0.499* [1.93]**	**0.554** [2.15]**
Log GDP per Capita (1990-2010)	1.645*** [5.30]	1.817*** [5.81]	2.473*** [6.85]	1.120*** [4.48]	1.503*** [5.07]	1.279*** [4.81]
Absolute Latitude	0.229*** [5.89]	0.227*** [5.98]	0.152*** [3.05]	0.074* [1.78]	0.043 [0.92]	0.072 [1.53]
Terrain Roughness	-1.373 [-0.52]	-0.773 [-0.31]	-0.730 [-0.28]	-4.850** [-2.26]	-4.643** [-2.13]	-6.718*** [-3.33]
Latin America & Caribbean	-2.015* [-1.70]	-1.761 [-1.50]	-1.786 [-1.43]	-3.168*** [-3.32]	-3.275*** [-3.56]	-5.069*** [-4.91]
Sub-Saharan Africa	0.384 [0.29]	0.774 [0.61]	1.520 [1.24]	-0.087 [-0.10]	0.267 [0.31]	-0.396 [-0.40]
East and Southeast Asia	-2.118 [-1.57]	-2.646* [-1.82]	-3.838** [-2.28]	-4.209*** [-3.64]	-4.653*** [-3.43]	-4.685*** [-3.78]
Log Population (1990-2010)		0.476* [1.71]	0.633** [2.37]	0.257 [1.11]	0.330 [1.50]	0.179 [0.93]
Log Population > 65 Years (1990-2010)				6.067*** [8.22]	5.720*** [8.31]	4.772*** [7.22]
Socialist Legal Origin			3.399 [1.09]		1.633 [0.64]	-3.661 [-1.24]
French Legal Origin			-0.298 [-0.09]		0.075 [0.03]	-5.635* [-1.73]
German Legal Origin			0.625 [0.15]		0.377 [0.11]	-4.117 [-1.32]
British Legal Origin			-1.493 [-0.49]		-1.275 [-0.50]	-5.668* [-1.93]
Share of Protestants						-0.058** [-2.59]
Share of Roman Catholics						0.035*** [2.97]
Share of Muslims						-0.019* [-1.71]
Constant	-8.261*** [-2.82]	-17.601*** [-3.10]	-23.715*** [-3.14]	-14.562*** [-3.15]	-17.520*** [-3.04]	-6.857 [-1.17]
Observations R-squared	131 0.7318	131 0.7396	131 0.7654	131 0.8300	131 0.8403	130 0.8732

Robust t-statistics in brackets. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 6 – Transfers: Greenberg's B-Index vs Peripheral Diversity

Dependent Varialble: Transfers 1990-2010	**(1)**	**(2)**	**(3)**	**(4)**
Greenberg	**-5.815*** [-3.38]**	**-1.652 [-1.19]**		
Peripheral Diversity			**-0.179 [-0.67]**	**0.137 [0.58]**
Log GDP per Capita (1990-2010)	1.804*** [5.75]	1.193*** [4.10]	1.867*** [5.77]	1.191*** [4.29]
Absolute Latitude	0.224*** [5.98]	0.066 [1.40]	0.247*** [5.93]	0.073 [1.51]
Terrain Roughness	-0.244 [-0.09]	-6.079*** [-2.77]	0.560 [0.20]	-6.289*** [-2.94]
Latin America and Caribbean	-1.726 [-1.49]	-5.575*** [-5.05]	-0.658 [-0.52]	-5.210*** [-5.01]
Sub-Saharan Africa	0.955 [0.72]	-0.815 [-0.73]	1.315 [0.93]	-0.756 [-0.72]
East and Southeast Asia	-1.977 [-1.19]	-4.013** [-2.56]	-1.736 [-1.10]	-4.313*** [-3.22]
Log Population (1990-2010)	0.570** [2.11]	0.307* [1.70]	0.673** [2.41]	0.286 [1.51]
Log Population > 65 Years (1990-2010)		4.696*** [6.67]		4.902*** [7.23]
Socialist Legal Origin		-2.624 [-0.84]		-3.210 [-1.09]
French Legal Origin		-4.389 [-1.31]		-4.937 [-1.56]
German Legal Origin		-3.565 [-1.09]		-3.716 [-1.19]
British Legal Origin		-4.694 [-1.53]		-5.273* [-1.82]
Share of Protestants		-0.036 [-1.29]		-0.044* [-1.91]
Share of Roman Catholics		0.040*** [2.96]		0.040*** [3.27]
Share of Muslims		-0.020* [-1.82]		-0.022* [-1.92]
Constant	-19.167*** [-3.42]	-9.402* [-1.69]	-23.959*** [-4.29]	-9.752* [-1.80]
Observations	131	130	131	130
R-squared	0.7328	0.8669	0.7120	0.8660

Robust t-statistics in brackets. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 7 – Transfers: Greenberg's B-Index vs Peripheral Diversity

Transfers 1990-2010	**(1)** **δ=0.1**	**(2)** **δ=0.1**	**(3)** **δ=0.9**	**(4)** **δ=0.9**
Greenberg's B-Index	**-9.700***** **[-3.80]**	**-5.298**** **[-2.12]**	**-7.714***** **[-3.51]**	**-4.250**** **[-2.22]**
Peripheral Diversity	**0.567**** **[2.36]**	**0.585** **[1.64]**	**0.450***** **[2.80]**	**0.489**** **[2.15]**
Log GDP per Capita (1990-2010)	1.895*** [6.34]	1.329*** [4.80]	1.801*** [5.64]	1.252*** [4.75]
Absolute Latitude	0.224*** [5.91]	0.065 [1.37]	0.229*** [5.96]	0.075 [1.58]
Terrain Roughness	0.049 [0.02]	-6.169*** [-2.97]	-0.971 [-0.38]	-6.857*** [-3.39]
Latin America and Caribbean	-1.294 [-1.09]	-4.968*** [-4.91]	-1.877 [-1.60]	-5.154*** [-4.94]
Sub-Saharan Africa	0.656 [0.51]	-0.458 [-0.48]	0.908 [0.71]	-0.417 [-0.42]
East and Southeast Asia	-2.507* [-1.71]	-4.483*** [-3.45]	-2.666* [-1.84]	-4.708*** [-3.81]
Log Population (1990-2010)	0.428 [1.56]	0.206 [1.06]	0.513* [1.84]	0.182 [0.95]
Log Population > 65 Years (1990-2010)		4.693*** [6.97]		4.794*** [7.23]
Socialist Legal Origin		-3.580 [-1.20]		-3.612 [-1.23]
French Legal Origin		-5.829* [-1.74]		-5.442* [-1.69]
German Legal Origin		-4.478 [-1.38]		-3.912 [-1.26]
British Legal Origin		-5.730* [-1.91]		-5.560* [-1.91]
Share of Protestants		-0.053** [-2.35]		-0.058** [-2.60]
Share of Roman Catholics		0.037*** [3.09]		0.035*** [2.96]
Share of Muslims		-0.018 [-1.62]		-0.019* [-1.76]
Constant	-18.084*** [-3.33]	-7.662 [-1.31]	-18.016*** [-3.12]	-6.860 [-1.18]
Observations R-squared	131 0.7412	130 0.8720	131 0.7369	130 0.8727

Robust t-statistics in brackets. *** p < 0.01, ** p < 0.05, * p < 0.1

Appendix A: Proof of Proposition 1

First consider the case $\tau_{0k} = \tau_{0l} = \tau$. We have to show that $s_k^* \geq s_l^*$. Suppose, to the contrary, that $s_k^* < s_l^*$. Let $s' \in \mathcal{S}_{kl}(\bar{s})$ be such that $s'_j = s_j^*$ for all $j \neq k$, $j \neq l$ and $s'_k = s'_l = x \equiv \frac{s_k^* + s_l^*}{2}$. Since $PA(s', T) < PA(s^*, T)$, it follows that

$$2f_{pc}(s_0, x, \tau) + 2f_{cp}(s_0, x, \tau) < f_{pc}(s_0, s_k^*, \tau) + f_{pc}(s_0, s_l^*, \tau) + f_{cp}(s_0, s_k^*, \tau) + f_{cp}(s_0, s_l^*, \tau). \quad (13)$$

By Condition 3, functions $f_{pc}(s_0, \ldots, \tau)$ and $f_{cp}(s_0, \ldots, \tau)$ are concave, which implies

$$f_{pc}(s_0, x, \tau) \geq \frac{1}{2} f_{pc}(s_0, s_k^*, \tau) + \frac{1}{2} f_{pc}(s_0, s_l^*, \tau) \quad (14)$$

and

$$f_{cp}(s_0, x, \tau) \geq \frac{1}{2} f_{cp}(s_0, s_k^*, \tau) + \frac{1}{2} f_{cp}(s_0, s_l^*, \tau). \quad (15)$$

It is straightforward to verify that inequalities (13), (14), (15) and can not hold simultaneously. Thus, we have that $s_k^* \geq s_l^*$. Notice that $\tau_{0l} = \tau_{0k}$ implies $s_l^* \geq s_k^*$ and $s_k^* \geq s_l^*$ so that $s_k^* = s_l^*$.

Now consider the case $\tau_{0k} > \tau_{0l}$. We shall show that $s_k^* \geq s_l^*$. Suppose, in negation, that $s_k^* < s_l^*$. Let $T' \in \mathcal{T}$, be such that $\tau'_{0j} = \tau_{0j}$ for all $j \neq l$ and $\tau'_{0l} = \tau_{0k}$. Notice that $\tau'_{0j} > \tau_{0l}$. Similarly to the previous examination, let $s' \in \mathcal{S}_{kl}(\bar{s})$ be such that $s'_j = s_j^*$ for all $j \neq k$, $j \neq l$ and $s'_k = s'_l = x \equiv \frac{s_k^* + s_l^*}{2}$. We have

$$PA(s', T) < PA(s^*, T). \quad (16)$$

This implies that

$$\begin{aligned} & f_{pc}(s_0, x, \tau_k) + f_{pc}(s_0, x, \tau_l) + f_{cp}(s_0, x, \tau_k) + f_{cp}(s_0, x, \tau_l) \quad (17) \\ < \; & f_{pc}(s_0, s_k^*, \tau_k) + f_{pc}(s_0, s_l^*, \tau_l) + f_{cp}(s_0, s_k^*, \tau_k) + f_{cp}(s_0, s_l^*, \tau_l), \end{aligned}$$

which is equivalent to

$$\begin{aligned} & f_{pc}(s_0, x, \tau_k) - f_{pc}(s_0, s_k^*, \tau_k) + f_{cp}(s_0, x, \tau_k) - f_{cp}(s_0, s_k^*, \tau_k) \quad (18) \\ < \; & f_{pc}(s_0, s_l^*, \tau_l) - f_{pc}(s_0, x, \tau_l) + f_{cp}(s_0, s_l^*, \tau_l) - f_{cp}(s_0, x, \tau_l). \end{aligned}$$

The argument used in case 1 above yields

$$PA(s', T') > PA(s^*, T'),$$

which implies that

$$
\begin{aligned}
& f_{pc}(s_0, x, \tau_k) + f_{pc}(s_0, x, \tau_k) + f_{cp}(s_0, x, \tau_k) + f_{cp}(s_0, x, \tau_k) \\
> \quad & f_{pc}(s_0, s_k^*, \tau_k) + f_{pc}(s_0, s_l^*, \tau_k) + f_{cp}(s_0, s_k^*, \tau_k) + f_{cp}(s_0, s_l^*, \tau_k).
\end{aligned} \tag{19}
$$

By rearranging the terms we obtain

$$
\begin{aligned}
& f_{pc}(s_0, x, \tau_k) - f_{pc}(s_0, s_k^*, \tau_k) + f_{cp}(s_0, x, \tau_k) - f_{cp}(s_0, s_k^*, \tau_k) \\
> \quad & f_{pc}(s_0, s_l^*, \tau_k) - f_{pc}(s_0, x, \tau_k) + f_{cp}(s_0, s_l^*, \tau_k) - f_{cp}(s_0, x, \tau_k).
\end{aligned} \tag{20}
$$

Inequalities (18) and (12) imply

$$
\begin{aligned}
& f_{pc}(s_0, s_l^*, \tau_k) - f_{pc}(s_0, x, \tau_k) + f_{cp}(s_0, s_l^*, \tau_k) - f_{cp}(s_0, x, \tau_k) \\
< \quad & f_{pc}(s_0, s_l^*, \tau_l) - f_{pc}(s_0, x, \tau_l) + f_{cp}(s_0, s_l^*, \tau_l) - f_{cp}(s_0, x, \tau_l).
\end{aligned} \tag{21}
$$

Since $s_l^* > x$ and $\tau_k > \tau_l$, Condition 4 implies that

$$
\begin{aligned}
f_{pc}(s_0, s_l^*, \tau_k) - f_{pc}(s_0, x, \tau_k) \quad &> \quad f_{pc}(s_0, s_l^*, \tau_l) - f_{pc}(s_0, x, \tau_l) \text{ and} \\
f_{cp}(s_0, s_l^*, \tau_k) - f_{cp}(s_0, x, \tau_k) \quad &> \quad f_{cp}(s_0, s_l^*, \tau_l) - f_{cp}(s_0, x, \tau_l),
\end{aligned} \tag{22}
$$

and (22) and (12) do not not hold simultaneously. Hence we conclude that $s_k^* \geq s_l^*$.

Appendix B: Data Sources

Absolute latitude. The absolute value of the latitude of a countrys approximate geodesic centroid, as reported by the CIAs World Factbook. *Source: Ashraf and Galor (2013).*

Child mortality. Log of child mortality rate per 1,000 live births, 1990-2010 average. *Source: World Development Indicators, World Bank.*

GDP per capita. GDP per capita, constant 2005 US$, 1990-2010 average. *Source: World Development Indicators, World Bank.*

Illiteracy. Percentage of people aged 15 and above who are illiterate, 1990-2010 average. *Source: World Development Indicators, World Bank.*

Improved sanitation. Percentage of population with access to improved sanitation facilities, 1990-2010 average. *Source: World Development Indicators, World Bank.*

Legal origin. Socialist, French, German or British legal origin *Source: La Porta, Lopez-de-Silanes and Shleifer (2008).*

Language data. Languages spoken in each country and language trees. *Source: Ethnologue: Languages of the World, 15th Edition, SIL International, 2005.*

Major religions. Share of protestants, catholics and muslims in the population. *Source: La Porta et al. (1999).*

Measles immunization. Percentage of children between the age of 12 and 23 months that have been immunized against measles, 1990-2010 average. *Source: World Development Indicators, World Bank.*

Population. Total population, 1990-2010 average. *Source: World Development Indicators, World Bank.*

Population above 65. Population ages 65 and above, % of total, 1990-2010 average. *Source: World Development Indicators, World Bank.*

School attainment. Log of 1 + average years of schooling of population aged 25 or above, 1990-2010 average. *Source: Barro R. and J.W. Lee v. 1.3, 04/13.*

Road density. Road network density, km per 1,000 inhabitants, 2001-2010 average. *Source: World Development Indicators, World Bank.*

Terrain roughness. The degree of terrain roughness of a country, calculated using geospatial surface undulation data reported by the G-ECON project (Nordhaus 2006) at a 1-degree resolution. *Source: Ashraf and Galor (2013).*

Tranfers Transfers and subsidies as percent of GDP: Average for 1990, 1995, 2000, 2005 and 2010. *Source: Gwartney, Lawson and Hall (2012), Economic Freedom Dataset, Fraser Institute.*

Table A1 – Indices of Linguistic Diversity – Greenberg and Peripheral

Country	Green	Peripheral	Ranking Green	Ranking Peripheral	Difference
Afghanistan	0.5025	1.9543	46	56	-10
Albania	0.1746	0.6157	135	151	-16
Algeria	0.2266	0.8056	122	125	-3
American Samoa	0.0929	0.3736	165	165	0
Andorra	0.1951	0.5329	130	153	-23
Angola	0.2136	1.1049	126	100	26
Anguilla	0.1405	0.3488	150	170	-20
Antigua and Barbuda	0.0566	0.2570	179	184	-5
Argentina	0.1706	0.9401	137	113	24
Armenia	0.1513	0.6285	146	146	0
Aruba	0.3774	1.0115	76	106	-30
Australia	0.0972	1.1795	162	94	68
Austria	0.2430	0.8443	114	121	-7
Azerbaijan	0.3643	1.5682	82	73	9
Bahamas	0.3593	0.8462	84	120	-36
Bahrain	0.5457	1.7588	37	64	-27
Bangladesh	0.1525	0.7960	145	127	18
Barbados	0.0910	0.2653	167	182	-15
Belarus	0.2374	0.7477	119	133	-14
Belgium	0.4798	1.8378	54	61	-7
Belize	0.6723	1.9368	6	57	-51
Benin	0.4567	2.7947	59	27	32
Bermuda	0.0000	0.0000	219	219	0
Bhutan	0.6000	3.3685	22	18	4
Bolivia	0.6685	2.0788	7	51	-44
Bosnia and Herzegovina	0.2467	0.7221	113	137	-24
Botswana	0.1528	1.0596	144	103	41
Brazil	0.0243	0.5203	199	155	44
British Indian Ocean Terr.	0.0000	0.0000	220	220	0
British Virgin Islands	0.1671	0.3911	139	162	-23
Brunei	0.3734	1.5568	78	74	4
Bulgaria	0.2092	0.7409	127	134	-7
Burkina Faso	0.4364	2.3456	62	42	20
Burundi	0.0018	0.0353	215	214	1
Cambodia	0.1307	0.6963	155	142	13
Cameroon	0.4984	5.4310	48	7	41
Canada	0.4129	2.4837	72	36	36
Cape Verde Islands	0.0699	0.2260	171	188	-17
Cayman Islands	0.5350	1.2683	42	89	-47
Central African Republic	0.5984	6.7938	23	3	20

Country	Green	Peripheral	Ranking Green	Ranking Peripheral	Difference
Chad	0.8035	7.2055	1	2	-1
Chile	0.0326	0.2097	194	189	5
China	0.3379	2.7538	90	30	60
Colombia	0.0288	0.6969	195	141	54
Comoros	0.1101	0.3554	159	168	-9
Congo	0.6050	5.1178	20	8	12
Cook Islands	0.0912	0.3058	166	175	-9
Costa Rica	0.0495	0.3572	185	166	19
Cote dIvoire	0.5350	3.4780	41	17	24
Croatia	0.0621	0.2895	176	178	-2
Cuba	0.0002	0.0060	217	218	-1
Cyprus	0.3643	0.7762	81	131	-50
Czech Republic	0.0477	0.2860	188	179	9
DRC	0.5497	3.9324	35	12	23
Denmark	0.0368	0.3209	192	173	19
Djibouti	0.3766	0.9986	77	107	-30
Dominica	0.3116	0.6535	98	144	-46
Dominican Republic	0.0528	0.2924	182	177	5
East Timor	0.6572	2.0903	8	49	-41
Ecuador	0.2559	1.1454	111	97	14
Egypt	0.2286	0.8285	121	124	-3
El Salvador	0.0043	0.0588	211	210	1
Equatorial Guinea	0.1842	0.7376	131	135	-4
Eritrea	0.5009	1.7238	47	65	-18
Estonia	0.4676	1.3485	56	84	-28
Ethiopia	0.5678	3.3114	30	19	11
Falkland Islands	0.0000	0.0000	222	222	0
Fiji	0.5294	1.8712	44	60	-16
Finland	0.1323	0.6435	154	145	9
France	0.1841	1.3533	132	83	49
French Guiana	0.4271	1.6219	68	70	-2
French Polynesia	0.3984	0.9369	73	115	-42
Gabon	0.3043	1.3563	100	82	18
Gambia	0.4917	1.7987	52	63	-11
Georgia	0.5386	2.2305	39	44	-5
Germany	0.1326	1.0805	152	102	50
Ghana	0.3687	2.2301	79	45	34
Gibraltar	0.4979	1.0252	49	104	-55
Greece	0.1297	0.7962	156	126	30
Greenland	0.2419	0.5056	116	156	-40

Country	Green	Peripheral	Ranking Green	Ranking Peripheral	Difference
Grenada	0.0519	0.2334	183	185	-2
Guadeloupe	0.0653	0.2852	175	180	-5
Guam	0.5666	1.3898	31	81	-50
Guatemala	0.6101	3.9733	18	11	7
Guinea	0.4802	2.0787	53	52	1
Guinea-Bissau	0.5659	1.9105	32	58	-26
Guyana	0.0778	0.5553	169	152	17
Haiti	0.0002	0.0094	218	217	1
Honduras	0.0528	0.3528	181	169	12
Hungary	0.1564	0.8722	141	119	22
Iceland	0.0106	0.0597	206	209	-3
India	0.6788	5.5610	5	6	-1
Indonesia	0.5504	6.0363	34	5	29
Iran	0.6390	3.7850	12	15	-3
Iraq	0.4612	1.6765	57	68	-11
Ireland	0.1510	0.4314	147	159	-12
Israel	0.5316	2.7665	43	29	14
Italy	0.2775	1.2882	105	87	18
Jamaica	0.0111	0.1307	205	200	5
Japan	0.0240	0.2035	200	190	10
Jordan	0.2203	0.7958	124	128	-4
Kazakhstan	0.6297	2.5050	16	35	-19
Kenya	0.5790	2.8531	28	25	3
Kiribati	0.0225	0.1361	201	199	2
Korea, North	0.0000	0.0000	223	223	0
Korea, South	0.0030	0.0404	212	211	1
Kuwait	0.2425	0.6266	115	147	-32
Kyrgyzstan	0.5923	2.1173	25	48	-23
Laos	0.5470	3.8126	36	14	22
Latvia	0.4290	1.3445	67	85	-18
Lebanon	0.1532	0.6160	143	150	-7
Lesotho	0.0584	0.1622	178	196	-18
Liberia	0.6031	3.0010	21	23	-2
Libya	0.1809	0.6260	133	148	-15
Liechtenstein	0.0658	0.2274	174	187	-13
Lithuania	0.2491	0.7916	112	129	-17
Luxembourg	0.3494	0.9708	88	108	-20
Macedonia	0.4608	1.1860	58	93	-35
Madagascar	0.2868	1.0950	103	101	2
Malawi	0.1703	0.7008	138	140	-2

Country	Green	Peripheral	Ranking Green	Ranking Peripheral	Difference
Malaysia	0.6476	3.5729	11	16	-5
Maldives	0.0047	0.0363	210	213	-3
Mali	0.6354	3.2920	14	21	-7
Malta	0.0157	0.0970	203	206	-3
Marshall Islands	0.0266	0.1295	196	201	-5
Martinique	0.0427	0.1944	190	191	-1
Mauritania	0.1713	0.6564	136	143	-7
Mauritius	0.6080	2.0883	19	50	-31
Mayotte	0.4372	0.9453	61	111	-50
Mexico	0.1325	3.1323	153	22	131
Micronesia	0.2644	0.9416	108	112	-4
Moldova	0.4293	1.2719	66	88	-22
Monaco	0.1792	0.3850	134	164	-30
Mongolia	0.2066	0.7702	128	132	-4
Montserrat	0.0257	0.1271	197	203	-6
Morocco	0.3351	0.9642	92	109	-17
Mozambique	0.2301	1.2064	120	92	28
Myanmar	0.3958	2.7874	74	28	46
Namibia	0.5640	1.9600	33	55	-22
Nauru	0.3499	0.9400	87	114	-27
Nepal	0.5370	3.8133	40	13	27
Netherlands	0.2603	1.3375	110	86	24
Netherlands Antilles	0.2148	0.7793	125	130	-5
New Caledonia	0.6334	4.3639	15	10	5
New Zealand	0.0991	0.7262	161	136	25
Nicaragua	0.0812	0.3477	168	171	-3
Niger	0.6120	2.2670	17	43	-26
Nigeria	0.6531	6.2270	10	4	6
Niue	0.0714	0.2289	170	186	-16
Norfolk Island	0.0000	0.0000	225	225	0
Northern Mariana Islands	0.5038	1.1789	45	95	-50
Norway	0.6362	2.3505	13	40	-27
Oman	0.4505	1.6025	60	72	-12
Pakistan	0.4332	2.0717	64	53	11
Palau	0.0491	0.1741	186	195	-9
West Bank and Gaza	0.1012	0.2787	160	181	-21
Panama	0.3233	1.1163	94	98	-4
Papua New Guinea	0.7966	16.1864	2	1	1
Paraguay	0.3352	1.4742	91	78	13
Peru	0.3664	2.5423	80	34	46

Country	Green	Peripheral	Ranking Green	Ranking Peripheral	Difference
Philippines	0.4720	3.3111	55	20	35
Pitcairn	0.0000	0.0000	226	226	0
Poland	0.0388	0.3195	191	174	17
Portugal	0.0137	0.1371	204	198	6
Puerto Rico	0.0356	0.1851	193	193	0
Qatar	0.5825	1.5415	27	75	-48
Reunion	0.0660	0.3412	173	172	1
Romania	0.1574	0.7065	140	139	1
Russia	0.2411	2.4452	117	38	79
Rwanda	0.0017	0.0373	216	212	4
St Helena	0.0000	0.0000	221	221	0
St Kitts and Nevis	0.0102	0.0765	207	208	-1
St Lucia	0.0198	0.1100	202	205	-3
St Pierre and Miquelon	0.1172	0.3873	157	163	-6
St Vincent and the Grenadines	0.0086	0.0960	209	207	2
Samoa	0.0020	0.0327	214	215	-1
San Marino	0.2390	0.4834	118	157	-39
Sao Tome e Principe	0.3575	0.9220	85	117	-32
Saudi Arabia	0.3554	1.3938	86	80	6
Senegal	0.4169	1.8800	70	59	11
Serbia and Montenegro	0.2850	0.9635	104	110	-6
Seychelles	0.0666	0.2934	172	176	-4
Sierra Leone	0.5875	2.1721	26	47	-21
Singapore	0.6538	2.4520	9	37	-28
Slovakia	0.2674	0.8299	107	123	-16
Slovenia	0.0929	0.4002	164	161	3
Solomon Islands	0.4970	2.8387	50	26	24
Somalia	0.0944	0.4519	163	158	5
South Africa	0.4952	1.6125	51	71	-20
Spain	0.1547	0.5279	142	154	-12
Sri Lanka	0.3109	0.7219	99	138	-39
Sudan	0.5414	4.8948	38	9	29
Suriname	0.7207	2.3556	3	39	-36
Swaziland	0.0439	0.1175	189	204	-15
Sweden	0.1345	0.9342	151	116	35
Switzerland	0.3870	1.4799	75	77	-2
Syria	0.3221	1.1149	95	99	-4
Taiwan	0.3215	1.0187	96	105	-9
Tajikistan	0.4355	1.6329	63	69	-6
Tanzania	0.3425	2.7305	89	31	58

Country	Green	Peripheral	Ranking Green	Ranking Peripheral	Difference
Thailand	0.4153	2.0042	71	54	17
Togo	0.4312	2.3459	65	41	24
Tokelau	0.0538	0.1937	180	192	-12
Tonga	0.0028	0.0225	213	216	-3
Trinidad and Tobago	0.5972	1.6849	24	67	-43
Tunisia	0.0095	0.1397	208	197	11
Turkey	0.2729	1.4994	106	76	30
Turkmenistan	0.3186	1.4721	97	79	18
Turks and Caicos Islands	0.1455	0.3568	149	167	-18
Tuvalu	0.0512	0.1276	184	202	-18
U.S. Virgin Islands	0.3329	0.8390	93	122	-29
Uganda	0.5742	2.8565	29	24	5
Ukraine	0.2968	1.2675	101	90	11
United Arab Emirates	0.6971	2.6813	4	32	-28
United Kingdom	0.1104	1.2293	158	91	67
Uruguay	0.0480	0.2640	187	183	4
USA	0.2631	2.2270	109	46	63
Uzbekistan	0.3616	1.7139	83	66	17
Vanuatu	0.4215	2.5879	69	33	36
Vatican State	0.0000	0.0000	224	224	0
Venezuela	0.0253	0.4011	198	160	38
Viet Nam	0.2023	1.8319	129	62	67
Wallis and Futuna	0.0589	0.1815	177	194	-17
Yemen	0.2907	0.8854	102	118	-16
Zambia	0.2254	1.1548	123	96	27
Zimbabwe	0.1501	0.6180	148	149	-1