

Who Should Own the Past?*

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Abstract

We examine restitution of cultural goods and its optimal form, i.e. whether restitution should be definite or take the form of a loan. We show that loan can be optimal when the source country is indispensable due to its cultural significance, while full restitution is optimal when the host country completes restoration. Relative valuations can drive restitution, but do not pin down its form. Finally, restitution is not always optimal despite source country's higher valuation for the cultural good. We apply our analysis to the restitution of Icelandic manuscripts and the proposed loan or restitution of Benin bronzes.

JEL classification: D23, H41, Z11

Keywords: public goods, cultural goods, restitution, property rights theory, long-term loan

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1 Introduction

The return of cultural goods to their country of origin has always been a contentious issue. One needs to look no further than the cases of the Icelandic manuscripts and of the Parthenon sculptures to get an idea of how controversial such restitutions are. The Icelandic manuscripts were returned to Iceland eighty years after the initial request. In the case of the Parthenon sculptures, the initial request for their return was made more than a century ago and the issue has yet to be resolved.¹

The issue of restitution of cultural goods is, in essence, a question of ownership. Who should own the cultural good, the country of origin or the host country? The debate over the ownership of such goods has been primarily based on legal, historical and moral arguments. Has the host country acquired the cultural good legally? Do colonial powers have a moral obligation to return cultural heritage back to their ex-colonies? This paper introduces a new economic perspective to restitution. We model cultural good as public good and analyze which ownership arrangement gives optimal incentives to invest both in its protection and restoration and in its display and study. In other words, we explore what ownership arrangement is in the best interests of the cultural good itself.

Good care of the cultural good depends on (i) resources and (ii) incentives. Lack of resources has been one of the most frequently cited arguments against restitution, but this position has changed in recent times due to the development of resources in source countries. For example, the British Museum no longer refers to this argument in opposing the restitution of Parthenon sculptures or the Benin bronzes.² Thus in the current more symmetric circumstances, the best care of the cultural good depends importantly on *incentives*. In this paper we focus on the incentive effects of various ownership arrangements.³ The property rights theory of Grossman and Hart (1986) and Hart

¹ For more details and for further examples see Greenfield (2007).

² <https://www.britishmuseum.org/about-us/british-museum-story/contested-objects-collection>. Accessed 2025-12-02.

³ Similar approach is echoed in the context of disposal of undisplayed objects in a report

and Moore (1990) and its application to public goods by Besley and Ghatak (2001) is the natural framework for addressing this question.

Full restitution is not the only form of return under discussion. When Emmanuel Macron opened his case for restitution of Africa's cultural heritage, he referred to "*temporary or definite restitution*".⁴ Temporary restitution is in fact a loan to the source country as the host country does not relinquish ownership.⁵ This is the form of return that was initially agreed for the Benin bronzes held by several European museums. In 2018, the European museums agreed to lend some of their Benin bronzes to the planned Edo Museum for West African Art on a rotating basis. Definite or full restitution transfers also the ownership to the source country – as in the case of the Icelandic manuscripts returned from Denmark. In this paper we explore the difference in these forms of return for the incentives to invest in the cultural good. We show that loan can be optimal when the source country becomes indispensable due to its cultural significance, while full restitution is optimal when the host country completes restoration.

There are two countries in our model, source country 1 (she) and host country 2 (he). Both countries make specific investments in the cultural good project. 2 invests in physical capital, such as restoration of the cultural good, while 1 invests in human capital, such as studying the history of the cultural good. Suppose also that 2 is indispensable due to his technical expertise, while 1 is moderately indispensable due to her local and cultural knowledge. We analyze how ownership and location of the cultural good affect investment

by the UK's National Museum Directors' council. Review and rationalisation of collections can lead to disposal, transfer of ownership, loan or sale of some objects. The report states that museums should be "*willing to dispose of objects when this will help to ensure their preservation, enable them to be more widely used and enjoyed, place them in a context where they are more valued and better understood, or release resources which could deliver more elsewhere*" (NMDC, 2003, p. 3). The report does not deal with repatriation or human remains.

⁴ Nayeri, Farah. 2018. "Museums in France Should Return African Treasures, Report Says." *The New York Times*, November 21. <https://www.nytimes.com/2018/11/21/arts/design/france-museums-africa-savoy-sarr-report.html>. Accessed 2021-12-08.

⁵ Macron later commissioned a report on African cultural heritage. The report recommends permanent restitution for "*any objects taken by force or presumed to be acquired through inequitable conditions*" (Sarr and Savoy, 2018, p. 61).

incentives. We assume that both countries prefer location in their own country and that 1 has a higher valuation for her cultural heritage than 2. These assumptions imply that the valuation difference is maximal when the cultural good is located in country 1. This property plays an important role in our analysis. We also assume that location in country 1 is first best as our focus is on national treasures.

Our first result is that restitution is not always optimal despite source country's higher valuation for the cultural good. Ownership and location in the lower valuation country 2 can be optimal as it can maximize 2's incentives to invest in physical capital. In a public good setup, 2's investment improves both parties default payoffs in Nash bargaining since public good benefits them even when no agreement is reached. Due to 1's higher valuation for her cultural heritage, 2's investment increases 1's default payoff more than his own, weakening 2's bargaining position. This negative bargaining effect adds to the holdup problem and 2's incentives are particularly poor under 1 ownership and location. Under 1 ownership 2's investment has full effect on the default payoffs as the physical capital investment remains fully sunk in the cultural good if 2 leaves the project. Location in 1 maximizes the valuation difference and, thus, 2's negative bargaining effect.

2's incentives can be improved by transferring ownership to 2 and moving location to country 2. 2-ownership reduces the negative bargaining effect because 2's investment does not have full effect on the default payoffs. Under 2-ownership it is 1 who leaves the project if they cannot reach an agreement. Since 1 is moderately indispensable, the value of 2's investment is reduced by 1's absence, curbing the negative bargaining effect. 2's incentives can be further improved by locating the cultural good in country 2 as that minimizes the valuation difference, mitigating 2's negative bargaining effect.⁶

Let us then turn our attention to 1's incentives. Since 1's investment is

⁶ We assume for simplicity that location does not limit 2's ability to invest in physical capital. 2 can restore the cultural good even when it is located in country 1. This could be achieved by visiting staff, which is in fact a common practise e.g. between the Arnarnagæan Institute at the University of Copenhagen and the Árni Magnússon Institute for Icelandic Studies in Reykjavik.

in human capital – which does not spill over to the project if she leaves – it does not affect the default payoffs under 2-ownership. Under 1-ownership 1’s investment does not affect the default payoffs either, as 1’s investment is productive only in the presence of indispensable 2. Therefore, transferring ownership to 2 does not affect 1’s incentives. However, location in country 2 reduces the value of 1’s investment and weakens 1’s incentives. But given the concavity of the benefit function, curbing 2’s negative bargaining effect by location in 2 can be optimal even when it results in some reduction in 1’s investment.⁷ We argue that the transfer of the Icelandic manuscripts to Denmark – by Icelandic bishops and scholars – was broadly consistent with these conditions. Denmark had indispensable expertise and the spillover from its investment was large, both from translating and publishing as well as from restoring and conserving the manuscripts.⁸

Our second result explores the difference in the forms of the return, i.e. whether full restitution or loan is optimal. Suppose 1 becomes fully indispensable as in the current era it is important for the artefact to engage with its original cultural environment. Then 2’s negative bargaining effect is eliminated under 2-ownership since 2’s investment is unproductive without indispensable 1. Thus, location in 2 is no longer needed to curb the negative bargaining effect and loan, i.e. 2-ownership and location in country 1, maximize 2’s incentives. Moving the cultural good to country 1 improves also 1’s incentives. Therefore, returning the cultural good to country 1 as a loan provides the best incentives for both countries when 1 is indispensable. However, if additionally 2 were to become relatively dispensable, then 1-ownership would introduce a positive bargaining effect for 1 (positive due to 1’s higher valuation for the

⁷ Additionally, the value of given investments in country 2 cannot be too low compared to country 1 for location in 2 to be optimal.

⁸ Note that in our model the countries engage in a joint cultural good project and any changes in ownership and location are legal and compensated for – as was the case for the Icelandic manuscripts. However, our result does not apply to illegal and uncompensated removal of cultural goods or to situations where the source country ceases to have an active role with the removed artefacts – as was the case e.g. with the Benin bronzes. Then our result simply means that restitution is not always optimal, even if the source country has higher valuation for the cultural good and is an active participant in the project.

cultural good) and maximize 1's incentives. Then full restitution can be optimal. We discuss the restitution of Benin bronzes to Nigeria in the light of this result. If the European museums continue to be indispensable, e.g. due to their expertise in conservation and exhibition design, Nigeria's indispensability implies that loan is optimal in our model. However, if the European museums become relatively dispensable – e.g. due to plans to avoid the Western 'glass box' exhibition style – full restitution can be optimal.

Full restitution is optimal also when 2 completes the restoration stage and changes to investing in human capital. Since there is no spillover from human capital, it is 1-ownership that eliminates 2's negative bargaining effect and location in 2 is no longer needed to mitigate it. Thus, 1-ownership and location, i.e. full restitution, is optimal as it maximizes also 1's incentives. We argue that the restitution of the Icelandic manuscripts is broadly consistent with this as restoration by Denmark was largely completed by the time the manuscripts were returned.

Furthermore, we show that the relative valuations for the cultural good can drive restitution. Strong national identity of the source country – increasing the value of source country location – or the diminished role of museums as ways to encounter other cultures – reducing the value of host country location – can result in the return of the cultural good. However, relative valuations alone do not pin down the form of the return but it depends on the technological factors discussed above.

Finally, we analyze less common forms of restitution, such as returning the cultural good to the source country under joint ownership or transferring ownership to the source country but keeping the cultural good in the host country as a loan. We find that joint ownership is optimal in circumstances where it is the only way to curb the negative bargaining effect, while loan of less significant artefacts to the host country as cultural 'ambassadors' is optimal when the host country is moderately indispensable.

Our paper provides the first economic analysis of restitution of cultural goods, to the best of our knowledge.⁹ Kremer and Wilkening (2025) focus on

⁹ See Gerstenblith (2023) for a recent interdisciplinary approach to restitution.

the opposite problem, that is how to keep antiquities in the home country. They examine trade in antiquities and the effect of export bans and long-term leases on the incentives to maintain and reveal antiquities. They argue that complementing export bans with long-term leases, where the value of the object is determined in the competitive market, can improve incentives, while preserving home country ownership and raising revenues.

Our theoretical framework is that of the property rights theory. Besley and Ghatak (2001) analyze ownership of public goods and show that ownership should be allocated to the party who values the public good the most, irrespective of the importance of investment or other technological factors. Subsequent work shows that ownership by the low-valuation party can be optimal if, for example, the public good is impure (Francesconi and Muthoo, 2011), the relationship is repeated (Halonen-Akatwijuka and Pafilis, 2020), or there is asymmetric information (Schmitz, 2021).¹⁰

Closely related to this paper, Halonen-Akatwijuka (2012) relaxes Besley and Ghatak’s (2001) assumption of relatively dispensable agents and shows that low-valuation ownership is optimal when the high-valuation agent is key investor and there are spillovers from her investment. In our paper, it is the spillovers from the low-valuation party – the relevant case for cultural goods – that drive the optimality of low-valuation ownership. Also related to our work is Halonen-Akatwijuka and Pafilis (2014), who introduce location choice to the framework in a specific setup and compare high-valuation and low-valuation ownership, but do not include joint ownership in the analysis. They find that location in the low-valuation country can mitigate the negative bargaining effect. They conclude that low-valuation location can maximize surplus if the low-valuation party is the key investor. However, joint ownership can improve upon that by eliminating the negative bargaining effect. Therefore, a fine balance of incentives is required for location in the low-valuation country to be optimal, as shown in this paper. Halonen-Akatwijuka and Pafilis (2014) also

¹⁰ Rasul (2006) applies this framework to child custody and introduces probability of divorce that depends on the investments. Whether sole custody by the high-valuation spouse or joint custody is optimal depends on the heterogeneity of valuations.

show that separating location from ownership – with ownership residing with the low-valuation party (equivalent to our loan) – can provide better incentives for both agents as compared to the same agent owning and hosting the public good. In this paper, we show in a general setup, that the optimality of loan is driven by the investment of the high-valuation party, as joint ownership maximizes low-valuation party’s investment.

Location of public goods has also been analyzed by Cremer et al. (1985). Using the Hotelling model, they examine the optimal number and location of local public goods, such as schools and hospitals. In their model, consumers are faced with a trade-off between transportation costs to public good facilities and the cost of setting up these facilities, which is covered through taxation. In our model, location is chosen to incentivize investments. Cremer et al. (1985) show that public goods should be located equidistantly.¹¹ Their analysis does not consider ownership.

Finally, our paper is also related to the leasing vs. ownership literature that has examined leasing in the context of the time inconsistency problem (e.g. Coase, 1972), as a response to adverse selection (e.g. Hendel and Lizzeri, 2002) and in a moral hazard setting (e.g. Henderson and Ioannides, 1983). This literature focuses on private goods and does not consider location. However, in our public goods context, location matters. In our paper, loan allows ownership to be separated from location. We examine the effect of ownership and location on investment incentives as well as the optimality of separating these two attributes through loans.

The rest of the paper is organized as follows. Section 2 presents the model. Section 3 examines how investment incentives depend on ownership and location. Section 4 analyzes the optimal form of restitution and also shows when it is not optimal to return the cultural good. Section 5 explores extensions. Section 6 applies our results to the restitution of Icelandic manuscripts and the proposed loan or restitution of Benin Bronzes to Nigeria. Section 7 concludes.

¹¹ Similar results are also found by Fujita (1986) and Sakashita (1987).

2 The model

We model cultural goods as public goods. There are two countries, source country 1 and host country 2, making specific investments, y_1 and y_2 , in the cultural good. Investments can be in physical capital, such as restoration and protection of the cultural good, or in human capital, such as studying the history of the cultural good and developing expertise in its conservation. The investments are measured by their costs, $c(y_i) = y_i$, and are observable to both countries but not verifiable to third parties.

The countries engage in a cultural good project, e.g. publishing manuscripts or developing an exhibition.¹² The cultural good provides benefit $v(12 | y_1, y_2)$ when countries 1 and 2 complete the project. We assume that the benefit function is symmetric in investments, $v(12 | y_1, y_2) = v(12 | y_2, y_1)$, increasing and concave, and satisfies the Inada end point conditions. We denote $v^i(12 | y_1, y_2) = \partial v(12 | y_1, y_2) / \partial y_i$ and assume $\partial^2 v(12 | y_1, y_2) / \partial y_i \partial y_j = 0$ for $i \neq j$. To simplify notation, we drop the reference to investments, unless necessary for clarity, and write total and marginal benefit as $v(12)$ and $v^i(12)$.

The countries value the project differently. Their valuation depends also on the location of the cultural good. The value of the cultural good to country i is $\Theta_i v(12)$ if it is located in country 1 and $\theta_i v(12)$ if located in country 2. We assume that each country prefers location in their own country, $\Theta_1 > \theta_1$ and $\Theta_2 < \theta_2$, and that country 1, the source country, has higher valuation for her cultural heritage, $\Theta_1 > \Theta_2$ and $\theta_1 > \theta_2$. These assumptions imply the following ranking.¹³

Assumption 1. $\Theta_1 > \theta_1 > \theta_2 > \Theta_2$.

Assumption 1 implies that location in country 2, the host country, reduces the

¹² For example, the Arnamagnæan Institute at the University of Copenhagen and the Árni Magnússon Institute for Icelandic Studies in Reykjavik work together on various projects, such as developing a joint electronic catalogue of their manuscripts. The Benin Dialogue Group – consisting of Nigerian representatives and European museums holding Benin bronzes – works together to facilitate the construction of a new museum in Benin City.

¹³ Alternative assumptions are explored in Section 5. Assumption 1 is reasonable for national treasures.

valuation difference, $\theta_1 - \theta_2 < \Theta_1 - \Theta_2$. This feature will play an important role in our analysis.

We also assume that for given investments location in the source country is optimal.

Assumption 2. $\Theta_1 + \Theta_2 > \theta_1 + \theta_2$.

Assumption 2 holds when Θ_1 is sufficiently large. This is a reasonable assumption for national treasures, the focus of this paper. However, location in the host country may improve incentives to invest in the cultural good.

The first best investments in the cultural good located in country 1 are given by

$$(\Theta_1 + \Theta_2) v^i(12) = 1 \quad i = 1, 2. \quad (1)$$

We furthermore analyze the ownership of the cultural good. The cultural good can be owned by country 1, country 2 or be jointly owned, denoted by J . We denote by $o : \ell$ a structure where $o \in \{1, 2, J\}$ is the owner and $\ell \in \{1, 2\}$ is the location. We are interested in 2:2 – i.e., where the cultural good is both owned by and located in the host country – as well as the return of the cultural good to the source country. The form of the return depends on who owns the cultural good. Full restitution occurs when also the ownership is transferred to country 1, 1:1. The Icelandic manuscripts are an example of this type of restitution. It is also possible for the host country to return the cultural good to the source country, but keep the ownership, i.e. return it as a loan, 2:1. This form of return is planned for the Benin bronzes. In addition to these common forms of return, our model offers further possibilities. The returned cultural good can be jointly owned, $J:1$, or ownership can be transferred to country 1 but the cultural good can be kept in country 2 as a loan, 1:2.

We take a normative approach and analyze the ownership structure that maximizes the joint surplus, in other words, maximizes the overall investments in the cultural good.¹⁴ We assume that contracts are incomplete so that date

¹⁴ Positive analysis would lead to the same optimal ownership structure as the countries would make lump sum transfers at date 0 to achieve the surplus maximizing structure.

0 contract can only be written on the ownership and location of the cultural good. The timing of the model is as follows.

0. Contract on ownership and location of the cultural good.
1. The countries invest in the cultural good.
2. The countries bargain and complete the cultural good project.¹⁵

At date 0 the ownership structure is chosen. At date 1 the countries make their investments anticipating date 2 division of surplus by Nash bargaining. At date 2 the countries bargain how to complete the project, e.g. they choose the specific design of the exhibition or the manuscripts to be published.¹⁶ We assume transferable utility, although – as is common in the public sector, e.g. Dixit (1996) – transfers need not be monetary.¹⁷

Default payoffs play an important role in bargaining and depend on who owns the cultural good. If the countries fail to reach an agreement, the owner has the residual control rights to complete the project without the other country – and without their human capital investment. However, since the cultural good is a public good, both countries can benefit from it even under disagreement. The default payoffs under country i ownership are $\Theta_k v(i)$ for $i, k = 1, 2$, if the cultural good is located in country 1 and $\theta_k v(i)$ if the cultural good is in country 2. $v(i)$ is weakly increasing and concave in investments. When $v(i)$ is strictly increasing, it satisfies Inada endpoint conditions. We denote

¹⁵ We assume that the time period between dates 1 and 2 is too short for renegotiating location. In the context of cultural goods, such negotiations are lengthy, lasting for decades.

¹⁶ It is assumed that plans about date 2 work cannot be included in date 0 contract due to uncertainty and transaction costs. For example, a new archaeology project linked to the building of the Edo Museum for West African Art will inform its curatorial narratives and future displays, including newly excavated objects. (<https://www.britishmuseum.org/blog/major-new-archaeology-project-site-new-museum-benin>. Accessed 2022-10-25.) Prior to excavations, these choices cannot be included in date 0 contract. Also, new research into Icelandic manuscripts may direct publication interest to further manuscripts in an unanticipated manner.

¹⁷ While the source countries might be financially constrained, they are culturally endowed. Utility can be transferred from the source country to the host country through access to important excavation sites, loan agreements or other forms of collaboration. For example, the British Museum, as part of a consortium, was granted by the Nigerian National Commission for Museums and Monuments the right to excavate the site where the proposed Edo Museum for West African Art is to be constructed. <https://www.britishmuseum.org/blog/major-new-archaeology-project-site-new-museum-benin>. Accessed 2025-10-31.

$v^k(i) = \partial v(i)/\partial y_k$ and assume $\partial^2 v(i)/\partial y_i \partial y_j = 0$ for $i, j = 1, 2, i \neq j$.

Assumption 3. (i) $v(12) \geq v(i)$ for $i = 1, 2$.

(ii) $v^i(12) \geq \max \{v^i(i), v^i(j)\}$ for $i, j = 1, 2, i \neq j$.

(iii) $v^{ii}(12) \leq \min \{v^{ii}(i), v^{ii}(j)\}$ for $i, j = 1, 2, i \neq j$, where $v^{ii}(A) = \partial^2 v(A)/\partial y_i^2$ for $A \in \{12, 1, 2\}$.

Assumption 3(i) states that it is efficient for the countries to complete the project together, while Assumption 3(iii) guarantees concavity of the payoff functions.¹⁸

According to Assumption 3(ii), the marginal return to investment is maximal when the countries work together to complete the project. The marginal return to country i 's investment when they work on their own, $v^i(i)$, depends on how indispensable country j is. If country j is fully indispensable, their absence reduces the marginal return to zero, $v^i(i) = 0$ for all y_i . A country can be indispensable if they have considerable expertise, e.g. in conservation of the cultural good. While if country j is dispensable, their absence does not reduce the marginal return to country i 's investment, $v^i(i) = v^i(12)$ for all y_i . In what follows, for simplicity we drop 'for all y_i ' in the conditions, unless necessary for clarity. We examine varying degree of indispensability so that $v^i(i) \in [0, v^i(12)]$.

The marginal return to country j 's investment when they leave the project, $v^j(i)$, depends on the type of investment. If the investment is in physical capital, the investment remains sunk in the cultural good and $v^j(i) = v^j(12)$. While if the investment is in human capital, j leaves the project with their human capital and $v^j(i) = 0$. In what follows, we refer to $v^j(i)$ as the spillover from j 's investment and allow for $v^j(i) \in [0, v^j(12)]$.

Finally, under joint ownership each country has a veto right and, therefore, they have to reach a unanimous decision about the completion of the project. Accordingly, the default payoffs are zero for each country.

¹⁸ In particular, Assumption 3(iii) is needed to guarantee concavity of 2's payoff function as will become clear later on.

The Nash bargaining outcome depends on ownership via the default payoffs and therefore ownership – and location – affect investment incentives at date 1. Our aim is to find the ownership structure and location that give the countries optimal incentives to invest in the cultural good, i.e. is in the best interest of the cultural good itself.

3 Ownership, location and investment incentives

To determine the optimal ownership and location of the cultural good, we start by examining the investment incentives in each structure.

3.1 Source country ownership and location

Let us first analyze incentives to invest when the cultural good is both owned by and located in country 1, 1:1. Nash bargaining leads to the following payoffs for the countries.

$$\begin{aligned} u_1^{1:1} &= \Theta_1 v(1) + \frac{1}{2} (\Theta_1 + \Theta_2) [v(12) - v(1)] - y_1 \\ &= \frac{1}{2} (\Theta_1 + \Theta_2) v(12) + \frac{1}{2} (\Theta_1 - \Theta_2) v(1) - y_1 \end{aligned} \quad (2)$$

$$u_2^{1:1} = \frac{1}{2} (\Theta_1 + \Theta_2) v(12) - \frac{1}{2} (\Theta_1 - \Theta_2) v(1) - y_2 \quad (3)$$

The investment incentives are

$$\frac{1}{2} (\Theta_1 + \Theta_2) v^1(12) + \frac{1}{2} (\Theta_1 - \Theta_2) v^1(1) = 1, \quad (4)$$

$$\frac{1}{2} (\Theta_1 + \Theta_2) v^2(12) - \frac{1}{2} (\Theta_1 - \Theta_2) v^2(1) = 1. \quad (5)$$

The investments are lower than the first best given in (1) due to the holdup problem, which gives the first term in (4) and (5). The second term – positive for country 1 and negative for country 2 – arises from the nature of the public

good: the countries can benefit from the cultural good even if they cannot agree how to work together. Country 2's investment increases high-valuation country 1's default payoff more than his own, weakening 2's bargaining position. This negative bargaining effect reduces 2's investment even from the holdup level and is maximal when the investment is fully sunk in the project, $v^2(1) = v^2(12)$, e.g. when 2's investment is in physical capital such as restoration of the cultural good. In this case 2 has poor incentives and 1:1 may not be the optimal structure. We initially assume that $v^2(1)$ is large and explore how to improve 2's incentives for restoration.

The second term in (4) is positive for country 1 because 1's investment increases her default payoff more than country 2's, improving 1's bargaining position. The strength of this positive bargaining effect depends on how dispensable country 2 is. If 2 is dispensable, $v^1(1) = v^1(12)$, the positive effect is strong. While if 2 is fully indispensable, $v^1(1) = 0$, the positive bargaining effect is eliminated.

Therefore, if country 2 invests in restoration and is indispensable due to his technical expertise, both countries have poor incentives under 1:1. Next we will examine if the incentives can be improved by transferring ownership to country 2 – but keeping location in country 1.

3.2 Loan to the source country

When country 2 owns the cultural good and loans it to country 1, 2:1, the default payoffs depend on $v(2)$, the benefit of the project in the absence of country 1. Nash bargaining payoffs are

$$u_1^{2:1} = \frac{1}{2} (\Theta_1 + \Theta_2) v(12) + \frac{1}{2} (\Theta_1 - \Theta_2) v(2) - y_1, \quad (6)$$

$$u_2^{2:1} = \frac{1}{2} (\Theta_1 + \Theta_2) v(12) - \frac{1}{2} (\Theta_1 - \Theta_2) v(2) - y_2, \quad (7)$$

and the incentives to invest are

$$\frac{1}{2} (\Theta_1 + \Theta_2) v^1(12) + \frac{1}{2} (\Theta_1 - \Theta_2) v^1(2) = 1, \quad (8)$$

$$\frac{1}{2} (\Theta_1 + \Theta_2) v^2(12) - \frac{1}{2} (\Theta_1 - \Theta_2) v^2(2) = 1. \quad (9)$$

(5) and (9) show that ownership improves 2's incentives by curbing the negative bargaining effect if $v^2(1) \geq v^2(2)$. This is the case if 2's investment is in restoration, $v^2(1) = v^2(12)$.

Also 1's incentives are improved if 2 is fully indispensable, $v^1(1) = 0 \leq v^1(2)$, as shown by (4) and (8). Owning the cultural good does not improve 1's bargaining position since she is fully dependent on indispensable 2. Therefore, transferring ownership to country 2 cannot weaken 1's incentives. Thus, ownership by country 2 improves both countries' incentives if 2 invests in restoration and has indispensable expertise.

Alternatively, if country 2 is quite dispensable, $v^1(1) > v^1(2)$, ownership strengthens 1's positive bargaining effect and allocating ownership to country 2 weakens 1's incentives.

3.3 Host country ownership and location

Let us now examine if 2's restoration incentives can be further improved by locating the cultural good in country 2. We can obtain the investment incentives under 2:2 from (8) and (9) by replacing Θ_i by θ_i .¹⁹

$$\frac{1}{2} (\theta_1 + \theta_2) v^1(12) + \frac{1}{2} (\theta_1 - \theta_2) v^1(2) = 1 \quad (10)$$

$$\frac{1}{2} (\theta_1 + \theta_2) v^2(12) - \frac{1}{2} (\theta_1 - \theta_2) v^2(2) = 1 \quad (11)$$

Location in country 2 reduces the valuation difference, $(\theta_1 - \theta_2) < (\Theta_1 - \Theta_2)$, and mitigates the negative bargaining effect for country 2. However, now also the first term in (11) is lower since $(\theta_1 + \theta_2) < (\Theta_1 + \Theta_2)$. Therefore 2:2 increases y_2 relative to 2:1 if the negative bargaining effect is strong enough:

$$v^2(2) > \theta^* v^2(12) \quad (12)$$

¹⁹ Similarly, the investment incentives under 1:2 can be obtained from (4) and (5) by replacing Θ_i by θ_i .

for all y_2 , where $\theta^* = \frac{(\Theta_1 + \Theta_2) - (\theta_1 + \theta_2)}{(\Theta_1 - \Theta_2) - (\theta_1 - \theta_2)} \in (0, 1)$.

Country 1's investment is lower under 2:2 relative to 2:1 since both the first and the second term are lower in (10) as compared to (8). However, since due to the negative bargaining effect 2's investment is lower than 1's in any structure, $y_2^{o:\ell} \leq y_1^{o:\ell}$, and the benefit function is concave, increasing the lower y_2 can be optimal even when it results in some reduction in the higher y_1 .

Finally, if 1 is sufficiently indispensable, $v^2(2) \leq \theta^* v^2(12)$, both countries' investments are higher under 2:1 and 2:2 cannot be optimal.

3.4 Joint ownership

Under joint ownership the countries have to reach a unanimous decision. Therefore, the default payoffs are zero and the countries split the surplus 50:50. If the cultural good is located in country 1, the payoffs are

$$u_i^{J:1} = \frac{1}{2} (\Theta_1 + \Theta_2) v(12) - y_i \quad i = 1, 2 \quad (13)$$

and the investment incentives are

$$\frac{1}{2} (\Theta_1 + \Theta_2) v^i(12) = 1 \quad i = 1, 2. \quad (14)$$

(14) shows that joint ownership provides the maximal incentives to 2 by eliminating the negative bargaining effect. However, also 1's positive bargaining effect is eliminated. Therefore, joint ownership may be too costly in terms of poor incentives for 1.

Note that location in country 1 maximizes the investments given joint ownership since $(\Theta_1 + \Theta_2) > (\theta_1 + \theta_2)$.

4 Return of the cultural good

Section 3 showed that host country ownership and location, 2:2, can provide good investment incentives when 2 invests in the restoration of the cultural good and has indispensable expertise. We summarize these results in Lemma

1. We denote investments under $o : \ell$ by $y_1^{o:\ell}$ and $y_2^{o:\ell}$ and for clarity include the relevant investment explicitly in the notation.

Lemma 1 (i) $y_2^{1:1} \leq y_2^{2:1}$ if $v^2(2|y_2) \leq v^2(1|y_2)$ for all y_2 . $y_2^{2:1} \leq y_2^{2:2}$ if $\theta^* v^2(12|y_2) \leq v^2(2|y_2)$ for all y_2 . $y_2^{2:2} < y_2^{J:1}$.

(ii) $y_1^{J:1} \leq y_1^{1:1}$. $y_1^{1:1} \leq y_1^{2:1}$ if $v^1(1|y_1) \leq v^1(2|y_1)$ for all y_1 . $y_1^{2:2} < y_1^{2:1}$.

All the proofs are in the Appendix.

Country 2's negative bargaining effect is significant under 1:1 when the spillover from 2's investment is large, $v^2(1) = v^2(12)$. Lemma 1 shows that 2-ownership can mitigate this incentive problem since $v^2(2) \leq v^2(1) = v^2(12)$. Location in country 2 can further decrease the negative bargaining effect by reducing the valuation difference. Joint ownership would eliminate the negative bargaining effect but it can be too costly in terms of poor incentives for country 1.

Country 1's incentives are improved by 2-ownership when 2 is relatively indispensable, $v^1(1) \leq v^1(2)$, as 2's indispensability limits 1's positive bargaining effect under 1-ownership. Locating the cultural good in country 2 weakens 1's incentives, but given the concavity of the benefit function it can be more than compensated by improvement in the lower investment by country 2.

Lemma 1 summarizes the main tradeoffs and demonstrates that a fine balance of incentives is required for 2:2 to be optimal. In Section 4.1 we introduce specific functional forms and show that such balance can indeed be stricken. Here we proceed with analyzing the return of the cultural good.

Proposition 2 (i) *Source country ownership and location, 1:1, is optimal if there is no spillover from host country's investment, $v^2(1) = 0$, and the host country is sufficiently dispensable, $v^1(1) \geq v^1(2)$.*

(ii) *Loan to the source country, 2:1, is optimal if the source country is fully indispensable, $v^2(2) = 0$, and the host country is sufficiently indispensable, $v^1(1) \leq v^1(2)$.*

When country 2 completes the restoration stage, $v^2(1) = 0$, 1:1 provides the best incentives for 2 as it eliminates the negative bargaining effect. Also

country 1 has maximal incentives under 1:1 if completion of the restoration also makes 2 relatively dispensable, $v^1(1) \geq v^1(2)$, strengthening the positive bargaining effect under 1-ownership. Therefore, full restitution is optimal.

In Section 6 we argue that in the case of the Icelandic manuscripts, restoration of the manuscripts was largely completed by the time they were returned to Iceland. Furthermore, Iceland developed expertise in close cooperation between the two countries, making Denmark relatively dispensable. According to Proposition 2(i), full restitution provides the best incentives for both Iceland and Denmark in such circumstances.

Return can also be optimal due to country 1's role. When it is important for the cultural good to engage with its original culture, country 1 is indispensable, $v^2(2) = 0$. Then 2's negative bargaining effect is eliminated under 2-ownership and location in country 2 cannot improve upon that. Therefore 2:1 provides the best incentives for 2. If country 2 has relatively indispensable expertise, $v^1(1) \leq v^1(2)$, also country 1 has best incentives under 2:1. Thus, optimal return takes the form of a loan.

In Section 6 we discuss the proposed loan of Benin bronzes to Nigeria in the light of this result. We argue that Nigeria has become indispensable as in the current era it is crucial for these artefacts to engage with their original culture. Return of Benin bronzes to Nigeria can then be optimal in our model. However, if the European museums continue to have indispensable expertise, e.g. in conservation and exhibition design, the optimal return takes the form of a loan. Relinquishing ownership to Nigeria would require that the European museums are relatively dispensable – as only then ownership strengthens Nigeria's incentives.

Relative valuations can also drive the optimality of restitution. However, its form is not pinned down but depends on the technological factors discussed above. First, even if 2:2 maximized the investments, it cannot be optimal if the value of given investments is sufficiently higher in country 1, i.e. $(\Theta_1 + \Theta_2) - (\theta_1 + \theta_2)$ is sufficiently large. The second effect is more subtle. In Section 3.3 we showed that 2:2 increases 2's investment relative to 2:1 if $v^2(2) > \theta^* v^2(12)$. This inequality can be satisfied only if $\theta^* < 1$. $\theta^* = \frac{(\Theta_1 + \Theta_2) - (\theta_1 + \theta_2)}{(\Theta_1 - \Theta_2) - (\theta_1 - \theta_2)}$ is the cost-

benefit ratio of moving location to country 2. If $\theta^* \rightarrow 1$, the cost of lower value of given investments outweighs the benefit of reduced valuation difference – and y_2 is larger under 2:1 relative to 2:2. Then 2:2 cannot be optimal since y_1 is always larger under 2:1. Given the ranking of valuations in Assumption 1, we can define $\theta_2 = \Theta_2 + \delta_1$, $\theta_1 = \Theta_2 + \delta_1 + \delta_2$ and $\Theta_1 = \Theta_2 + \delta_1 + \delta_2 + \delta_3$. Therefore,²⁰

$$\theta^* = \frac{\delta_3 - \delta_1}{\delta_3 + \delta_1} \quad (15)$$

and, consequently, $\lim_{\delta_1 \rightarrow 0} \theta^* = \lim_{\delta_3 \rightarrow \infty} \theta^* = 1$.²¹ Accordingly, when θ_2 is sufficiently close to Θ_2 or Θ_1 is sufficiently large, 2:2 cannot be optimal. Proposition 3 summarizes the above analysis.

Proposition 3 *Host country ownership and location, 2:2, cannot be optimal if $(\Theta_1 + \Theta_2) - (\theta_1 + \theta_2)$ is sufficiently large.*

Return of the cultural good is optimal when 2's valuation for the cultural good located in the host country, θ_2 , is low. θ_2 can be low e.g. when there are good opportunities to encounter other cultures. Such opportunities were limited in the 19th century and early 20th century when, for example, Picasso saw an African mask in an exhibition inspiring his African era. Alternatively, strong national identity – such as when Iceland gained independence from Denmark – increases country 1's valuation for the cultural good located in the source country, Θ_1 . Both factors can make the return of the cultural good optimal but its form depends on the technological factors.

4.1 Parametric example

We will now introduce specific functional forms and demonstrate that location in country 2 – requiring a fine balance of incentives – can indeed be optimal. We assume that $v(12) = (y_1)^{\frac{1}{2}} + (y_2)^{\frac{1}{2}}$ and $v(i) = \lambda_j(y_i)^{\frac{1}{2}} + \mu_j(y_j)^{\frac{1}{2}}$ where $\lambda_j \in [0, 1]$ is the degree of country j 's dispensability and $\mu_j \in [0, 1]$ is the degree of spillover from country j 's investment.

²⁰ Note that by Assumption 2 $\delta_3 > \delta_1$.

²¹ Furthermore, $\partial\theta^*/\partial\theta_2 < 0$ and $\partial\theta^*/\partial\Theta_1 > 0$.

Proposition 4 finds when 2:2 is optimal.

Proposition 4 *Host country ownership and location, 2:2, is optimal if the source country is moderately indispensable, $\lambda_1 \in [\underline{\lambda}, \min\{\mu_2, \bar{\lambda}\}]$, the host country is sufficiently indispensable, $\lambda_2 \leq \mu_1$, and the reduction in the value of given investments due to location in the host country is sufficiently small, $(\Theta_1 + \Theta_2) - (\theta_1 + \theta_2) < \bar{\Theta}$, where $0 < \underline{\lambda} < \bar{\lambda} < 1$ and $\bar{\Theta} > 0$.*

According to Proposition 4, optimality of 2:2 requires firstly that the spillover from 2's investment is large enough, $\mu_2 \geq \underline{\lambda}$, so that the negative bargaining effect under 1-ownership is significant. The negative bargaining effect can be reduced by 2-ownership if $\lambda_1 < \mu_2$ as a smaller proportion of 2's investment goes to the default payoffs. Location in country 2 further decreases the negative bargaining effect by reducing the valuation difference. 2:2 is then optimal if λ_1 is so large that it is necessary to change also the location to curb the negative bargaining effect, $\lambda_1 \geq \underline{\lambda}$, but not so large that it would be better to eliminate it by joint ownership, $\lambda_1 \leq \bar{\lambda}$.

Country 1's incentives are not weakened by 2-ownership when 2 is quite indispensable, $\lambda_2 \leq \mu_1$, as 2's indispensability limits 1's positive bargaining effect under 1-ownership. Locating the cultural good in country 2 weakens 1's incentives, but 2:2 is optimal when this is outweighed by increase in country 2's lower investment. If additionally the value of given investments in country 2 is not too low compared to country 1, $(\Theta_1 + \Theta_2) - (\theta_1 + \theta_2) < \bar{\Theta}$, 2:2 maximizes the surplus.

In Section 6 we argue that the transfer of the Icelandic manuscripts to Denmark, by Icelandic bishops and scholars, is broadly consistent with the conditions of Proposition 4. Denmark had indispensable expertise in studying and publishing medieval manuscripts and the spillover from its investment in translating, publishing and restoring the manuscripts was large. Furthermore, Iceland was moderately indispensable due to limited knowledge of Old Norse-Icelandic in Denmark.

Figure 1(a) illustrates Propositions 2 and 4. Parameter λ_1 measures the strength of 2's negative bargaining effect under 2-ownership while μ_2 measures

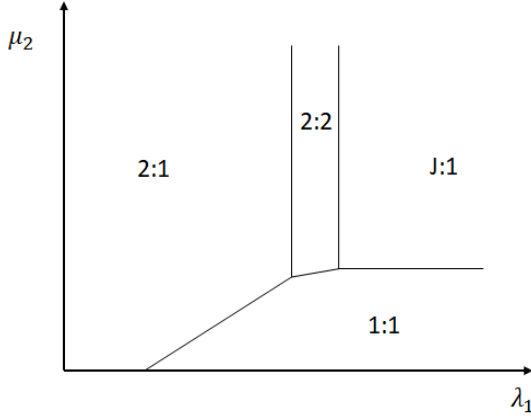


Figure 1(a): Optimal structure $\mu_1 > \lambda_2$

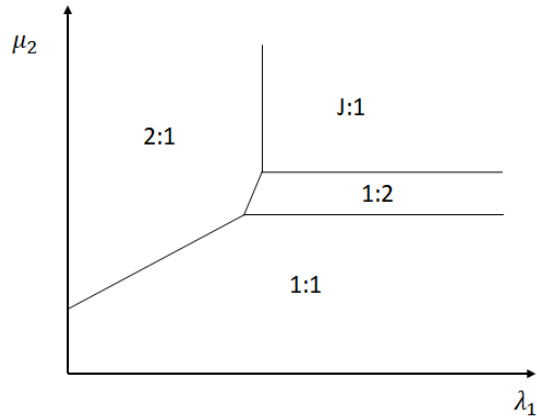


Figure 1(b): Optimal structure $\mu_1 < \lambda_2$

it under 1-ownership. As per Proposition 4, optimality of 2:2 requires large enough μ_2 and intermediate λ_1 .²² 2:1 is optimal if λ_1 is small as then 2's negative bargaining effect is small under 2-ownership and location in country 2 is not needed to further curb it, as per Proposition 2(ii). Finally, if μ_2 is small, country 2's incentives are not weakened much by 1-ownership and therefore 1:1 is optimal, as per Proposition 2(i).²³

Let us explore further the case where country 1 is fully indispensable. Proposition 2(ii) showed that in that case 2:1 provides maximal incentives for both countries if also $\lambda_2 \leq \mu_1$. However, if country 2 is relatively dispensable so that $\lambda_2 > \mu_1$ – and μ_1 is sufficiently small – country 1 has much better incentives under 1:1. If furthermore μ_2 is sufficiently small so that 2's negative bargaining effect is limited – even if not eliminated – under 1:1, then surplus is maximized under 1:1 even though country 1 is indispensable. This result is proved in Proposition 5 and illustrated in Figure 1(b).

²² Figure 1(a) is drawn for $\mu_1 = 0.7$ and $\lambda_2 = 0.4$ satisfying the condition in Proposition 4. Figure 1(b) is drawn for $\mu_1 = 0.4$ and $\lambda_2 = 0.7$.

²³ The exception is when λ_1 is very small as also 2:1 is effective in limiting the negative bargaining effect. Then 2:1 is optimal, as in Figure 1(a) – unlike in Proposition 2(i) – $\mu_1 > \lambda_2$ and therefore country 1's investment is higher under 2:1 than under 1:1.

Proposition 5 *Suppose the source country is fully indispensable, $\lambda_1 = 0$. 1:1 is optimal if the host country is sufficiently dispensable, $\lambda_2 \in (\hat{\lambda}, 1]$, and the spillover from both countries' investments is sufficiently small, $\mu_1 \in [0, \tilde{\mu})$ and $\mu_2 \in [0, \hat{\mu})$, where $\hat{\lambda} > \mu_1$ and $\max\{\tilde{\mu}, \hat{\mu}\} < 1$.*

In the context of Benin bronzes, Proposition 5 demonstrates that while Nigeria's indispensability leads to the return of the artefacts in our model, its form depends crucially on how indispensable the host country is. If the Western museums have relatively indispensable expertise, e.g. in conservation and exhibition design, then the optimal form of return is loan as per Proposition 2(ii). However, if the Western museums are quite dispensable, e.g. due to plans to avoid Western 'glass box' exhibition style – and the spillovers are low – full restitution is optimal according to Proposition 5.

Finally, while full restitution and loan to the source country are the common forms of return, our model includes further possibilities which are examined in Proposition 6.

Proposition 6 (i) *Joint ownership and source country location, J:1, is optimal if $\lambda_1 \in [\bar{\lambda}, 1]$ and $\mu_2 \in [\bar{\mu}, 1]$.*

(ii) *Loan to the host country, 1:2, is optimal if $\mu_2 \in [\underline{\mu}, \min\{\bar{\mu}, \lambda_1\}]$, $\lambda_2 \geq \mu_1$ and $(\Theta_1 + \Theta_2) - (\theta_1 + \theta_2) < \tilde{\Theta}$, where $0 < \underline{\mu} < \bar{\mu} < 1$ and $\tilde{\Theta} > 0$.*

Joint ownership may be the only way to curb 2's negative bargaining effect. This is the case when country 1 is quite dispensable, $\lambda_1 > \bar{\lambda}$, and the spillover from country 2 is large, $\mu_2 > \bar{\mu}$. Then joint ownership is optimal as demonstrated in Figures 1(a) and 1(b).

The final form of return is to transfer ownership to the source country but keep the cultural good in the host country as a loan, 1:2. If country 1 is quite dispensable, $\lambda_1 \geq \underline{\mu}$, the negative bargaining effect is large under 2-ownership. While it can be reduced by 1-ownership when $\mu_2 < \lambda_1$, it remains relatively large if $\mu_2 \geq \underline{\mu}$ and can be mitigated by location in country 2. Joint ownership would eliminate the negative bargaining effect, but also reduce country 1's investment as 1-ownership motivates her when 2 is quite dispensable, $\lambda_2 \geq \mu_1$.

Under these conditions, loan to the host country maximizes the investments – and also the surplus if the value of given investments is sufficiently high in country 2. Figure 1(b) illustrates that 1:2 is optimal for large enough λ_1 and intermediate μ_2 .

5 Extensions

Our main model assumes that each country prefers location in their own country and the source country has higher valuation for her cultural heritage irrespective of location. These assumptions are reasonable for national treasures. We now modify the assumptions to allow for artefacts that have less cultural significance to the source country. Section 5.1 explores the case where the source country prefers to locate the artefact in the host country as cultural ‘ambassador’, $\theta_1 > \Theta_1$, while in Section 5.2 country 2 becomes the higher valuation party by hosting the artefact, $\theta_2 > \theta_1$.²⁴ Furthermore, Section 5.3 examines asymmetric bargaining power and Section 5.4 explores alternative welfare criteria to joint surplus maximizing.

5.1 Cultural goods as ambassadors

The source country may prefer to keep some artefacts in the host country as ambassadors of her culture. These are important artefacts that would raise the profile of the source country when located in the host country, but do not hold the same significance to the source country as national treasures. For example, less significant Benin bronzes could be such artefacts. We therefore change Assumptions 1 and 2 to:

Assumption 1’. (i) $\theta_1 > \Theta_1$ and $\theta_2 > \Theta_2$.

(ii) $\theta_1 - \theta_2 < \Theta_1 - \Theta_2$.

²⁴ An alternative case is where both countries prefer location in the source country. This is covered by the main model; see footnote 25 for details. As in the main model, we argue that the source country is always the higher valuation party for cultural goods located in country 1, $\Theta_1 > \Theta_2$.

While country 1 prefers location in country 2, it is reasonable to assume that location premium is lower for country 1, $\theta_1 - \Theta_1 < \theta_2 - \Theta_2$, implying that the valuation difference is smaller in country 2, $\theta_1 - \theta_2 < \Theta_1 - \Theta_2$, explaining Assumption 1'(ii). Note that the first-order conditions for investments are equivalent to our main model. However, $\theta_1 + \theta_2 > \Theta_1 + \Theta_2$ since both countries prefer location in the host country.²⁵

Since location in country 2 both maximizes the value of given investments and minimizes the valuation difference, there is little reason to locate such cultural goods in country 1. If there is no spillover from 2's investment, $v^2(1) = 0$, loan to country 2, 1:2, eliminates 2's negative bargaining effect and maximizes his investment. While for 1 to have maximal investment under 1:2 requires both maximizing the positive bargaining effect for given location, $v^1(1) \geq v^1(2)$, and larger investment in country 2, $v^1(1) \leq \theta^{**}v^1(12)$, where $\theta^{**} = \frac{(\theta_1 + \theta_2) - (\Theta_1 + \Theta_2)}{(\Theta_1 - \Theta_2) - (\theta_1 - \theta_2)} \in (0, 1)$. The second condition is a mirror image of (12) and requires 1's positive bargaining effect – which is greater in country 1 – to be sufficiently weak so that $y_1^{1:2} \geq y_1^{1:1}$.²⁶

By similar logic, ownership by country 2, 2:2, eliminates 2's negative bargaining effect if 1 is fully indispensable, $v^2(2) = 0$, and maximizes 1's investment if $v^1(1) \leq v^1(2) \leq \theta^{**}v^1(12)$.

Proposition 7 *Under Assumption 1',*

(i) *Loan to the host country, 1:2, is optimal if there is no spillover from host country's investment, $v^2(1) = 0$, and the host country is moderately indispensable, $v^1(2) \leq v^1(1) \leq \theta^{**}v^1(12)$, where $\theta^{**} = \frac{(\theta_1 + \theta_2) - (\Theta_1 + \Theta_2)}{(\Theta_1 - \Theta_2) - (\theta_1 - \theta_2)} \in (0, 1)$.*

(ii) *Host country ownership and location, 2:2, is optimal if the source country is indispensable, $v^2(2) = 0$, and there is moderate spillover from source country's investment, $v^1(1) \leq v^1(2) \leq \theta^{**}v^1(12)$.*

²⁵ Another alternative is that both countries prefer location in country 1, $\Theta_1 > \theta_1$ and $\Theta_2 > \theta_2$, but 2 has lower location premium, $\Theta_2 - \theta_2 < \Theta_1 - \theta_1$. In this case the analysis of the main model applies. In particular, location in country 2 can be optimal even when both countries prefer location in country 1 for given investments.

²⁶ If $v^1(1) > \theta^{**}v^1(12)$, 1's positive bargaining effect is so strong that $y_1^{1:2} < y_1^{1:1}$. However, location in country 1 is unlikely to be optimal since the reduction in the lower y_2 has greater impact due to concavity of the benefit function.

According to Proposition 7, it is optimal for the artefact to remain in the host country on loan, as an ambassador of the source country's culture, when the host country does not invest in restoration, $v^2(1) = 0$, and is moderately indispensable. In Section 6, we argue that these conditions are broadly satisfied in the case of the less significant Benin bronzes in German collections, given the global reach of these museums. However, if the host country makes important restoration investments and has indispensable expertise, $v^1(1) \leq v^1(2)$, loan would result in poor incentives for both countries. Incentives can then be improved if the host country would also retain ownership, particularly when the source country holds an indispensable role, $v^2(2) = 0$.

5.2 Higher valuation host

Consider now cultural goods that would not serve effectively as cultural ambassadors. This could be because they have limited cultural connection to the source country – such as a Hellenistic statue of Apollo discovered in the Gaza Strip. Alternatively, it could be because the type of artefacts are found in abundance – such as mass-produced Han Dynasty pottery funerary figures. In these cases, while 1's valuation for the artefact is higher when located in the source country, $\Theta_1 > \theta_1$, 2 becomes the higher valuation party when he hosts it, $\theta_2 > \theta_1$. Thus, Assumption 1 changes to:

Assumption 1'. $\Theta_1 > \theta_2 > \theta_1 > \Theta_2$.

Under Assumption 1' the second terms in the first order conditions for $\ell = 2$ change sign. Accordingly, it is 2 who has the positive bargaining effect, while 1 has the negative bargaining effect. In what follows we show that 2:2 and 1:2 are optimal under different conditions than in Propositions 4, 6 and 7, while the results regarding the optimal form of return to the source country remain similar to our main model.

Under Assumption 1' 1:2 dominates 2:2 when 2 invests in restoration, $v^2(1) = v^2(12)$, and has indispensable expertise, $v^1(1) = 0$. Country 2's large negative bargaining effect under 1:1 can be turned to a large positive bargaining effect by locating the cultural good in country 2, 1:2. Furthermore, 1:2

eliminates 1's negative bargaining effect since 2 is indispensable. We argue that this result is broadly consistent with the long-term loan of several thousand Hittite cuneiform tablets from the Ottoman authorities to the Vorderasiatisches Museum in Berlin for restoration and study.²⁷

2:2 is now optimal under different conditions. Country 2's positive bargaining effect is maximized under 2:2 if 1 is dispensable, $v^2(2) = v^2(12)$. At the same time 1's negative bargaining effect is eliminated if there is no direct spillover from her, $v^1(2) = 0$.²⁸ These are reasonable assumptions for less significant cultural goods located in host country museum: the source country does not engage in their restoration or have expertise that the host country depends on.

Proposition 8 *Under Assumptions 1'' and 2,*

(i) 2:2 is optimal if the source country is dispensable, $v^2(2) = v^2(12)$, there is no spillover from her investment, $v^1(2) = 0$, the host country is not dispensable, $v^1(1) < v^1(12)$, there is some spillover from his investment, $v^2(1) > 0$, and $(\Theta_1 + \Theta_2) - (\theta_1 + \theta_2)$ is sufficiently small.

(ii) 1:2 is optimal if the host country is indispensable, $v^1(1) = 0$, and there is full spillover from his investment, $v^2(1) = v^2(12)$, the source country is not indispensable, $v^2(2) > 0$, and there is not full spillover from her investment, $v^1(2) < v^1(12)$, and $(\Theta_1 + \Theta_2) - (\theta_1 + \theta_2)$ is sufficiently small.

Full restitution remains optimal under similar conditions as in Proposition 2(i). When the host country completes restoration, 1:1 eliminates 2's negative

²⁷ The tablets, discovered in Hattusha (modern-day Boğazköy, Turkey) at the turn of the twentieth century, constitute a historical record of the now extinct Hittite civilisation (Greenfield, 2007, p. 382). The Ottoman authorities at the time had limited archaeological expertise and fragmentary knowledge of the Hittite civilisation. As a result, they relied on foreign partners through joint programs, as in the case of the excavation of Hattusha, which was led by a German team (Willert, 2021; Heffron and Çağlar, 2024). The Vorderasiatisches Museum had developed expertise in Near Eastern civilisations and had the resources to carry out restoration work, thus making it indispensable. <https://www.smb.museum/museen-einrichtungen/vorderasiatisches-museum/sammeln-forschen/sammlung/>. Accessed 2025-10-31.

²⁸ Additionally, optimality of 2:2 requires that 1:1 does not eliminate the negative bargaining effect or provide the maximal positive bargaining effect. That is, there is some direct spillover from 2, $v^2(1) > 0$, and 2 is not dispensable, $v^1(1) < v^1(12)$ Furthermore, $(\Theta_1 + \Theta_2) - (\theta_1 + \theta_2)$ is small.

bargaining effect since there is no spillover from his investment. Furthermore, 1's positive bargaining effect is maximal if country 2 becomes dispensable.

Finally, loan to the source country is optimal under broadly similar conditions as in Proposition 2(ii). 2:1 eliminates 2's negative bargaining effect when 1 is indispensable, $v^2(2) = 0$, and location in country 2 cannot improve upon that in terms of negative bargaining effect (for country 1). 2:1 is then optimal if furthermore location in country 2 – and specifically 1:2 – cannot provide a larger positive bargaining effect (for country 2). This is the case if $v^1(2) \geq v^2(1)$. According to Proposition 2(ii), 2:1 provides maximal incentives for country 1 if $v^1(2) \geq v^1(1)$. Combining these inequalities to $v^1(2) \geq \max[v^1(1), v^2(1)]$, 2:1 is optimal under both Assumption 1 and 1" when country 1 is indispensable.

5.3 Asymmetric bargaining powers

In the main model, we assume that the source country and the host country have equal bargaining powers. However, the host country may have stronger bargaining power due to its significant economic or political weight. We now allow the two countries to have different bargaining powers and apply the generalized Nash bargaining solution, denoting the source country's bargaining power by $\alpha \in [0, \frac{1}{2}]$.

The generalized Nash bargaining solution gives the following payoffs under 1:1.

$$u_1^{1:1} = \Theta_1 v(1) + \alpha (\Theta_1 + \Theta_2) [v(12) - v(1)] - y_1$$

$$u_2^{1:1} = \Theta_2 v(1) + (1 - \alpha) (\Theta_1 + \Theta_2) [v(12) - v(1)] - y_2$$

Each country gets its default payoff plus a share of the gains from trade, determined by their bargaining powers. The investment incentives are then

$$\alpha (\Theta_1 + \Theta_2) v^1(12) + [(1 - \alpha)\Theta_1 - \alpha\Theta_2]v^1(1) = 1, \quad (16)$$

$$(1 - \alpha) (\Theta_1 + \Theta_2) v^2(12) - [(1 - \alpha)\Theta_1 - \alpha\Theta_2]v^2(1) = 1. \quad (17)$$

A decrease in country 1's bargaining power, α , decreases her share of the gains from trade, leading to weaker incentives. Country 2's incentives are, however, improved as lower α increases his share of the gains from trade.

The incentives to invest under 2:1 are

$$\alpha (\Theta_1 + \Theta_2) v^1(12) + [(1 - \alpha)\Theta_1 - \alpha\Theta_2]v^1(2) = 1, \quad (18)$$

$$(1 - \alpha) (\Theta_1 + \Theta_2) v^2(12) - [(1 - \alpha)\Theta_1 - \alpha\Theta_2]v^2(2) = 1. \quad (19)$$

Comparison of (16) with (18) and (17) with (19) shows that for any $\alpha \in [0, \frac{1}{2}]$ 1:1 and 2:1 remain optimal under the same conditions as in Proposition 2. 1:1 maximizes both countries' investments when 2 completes restoration, $v^2(1) = 0$, and is sufficiently dispensable, $v^1(1) \geq v^1(2)$, while 2:1 is optimal when 1 is fully indispensable, $v^2(2) = 0$, and 2 is sufficiently indispensable, $v^1(1) \leq v^1(2)$.²⁹

Finally, the investment incentives under 2:2 are

$$\alpha (\theta_1 + \theta_2) v^1(12) + [(1 - \alpha)\theta_1 - \alpha\theta_2]v^1(2) = 1, \quad (20)$$

$$(1 - \alpha) (\theta_1 + \theta_2) v^2(12) - [(1 - \alpha)\theta_1 - \alpha\theta_2]v^2(2) = 1. \quad (21)$$

According to (19) and (21), location in country 2 is the more effective in curbing 2's negative bargaining effect, the lower is α . However, lower α leads also to a greater reduction in the first term, and this is the dominant effect. For 2:2 to increase y_2 relative to 2:1 requires a stricter condition than (12):

$$v^2(2) > \hat{\theta}v^2(12) \quad (22)$$

for all y_2 , where $\hat{\theta} = \frac{(1-\alpha)[(\Theta_1+\Theta_2)-(\theta_1+\theta_2)]}{[(1-\alpha)\Theta_1-\alpha\Theta_2]-[(1-\alpha)\theta_1-\alpha\theta_2]} \in (0, 1)$ and $\hat{\theta} \geq \theta^*$. If (22) is satisfied, there is a similar tradeoff as in the main model, and 2:2 can increase

²⁹ This result differs importantly from Schmitz (2013) who – assuming that the parties are dispensable – finds that optimal ownership depends on the parties' bargaining powers. In particular, the party with sufficiently low bargaining power should own the public good irrespective of their relative valuation.

joint surplus relative to 2:1 as the benefit of higher y_2 outweighs the cost of lower y_1 .

5.4 Alternative welfare criterion

We have taken normative approach and examined joint surplus maximizing ownership structure. Optimal structure maximizes the overall investments in the cultural good, i.e., is in the best interests of the cultural good.³⁰ Alternative welfare criterion could emphasize the source country's payoff, for example maximize it.³¹ Interestingly, these alternatives are qualitatively similar. The reason is that $J:1$ maximizes country 2's payoff for all parameter values, while the joint surplus maximizing structure is largely driven by country 1's payoff. As the lower valuation party, country 2 in general gets less than half of the surplus in Nash bargaining. However, under joint ownership the parties split the surplus 50:50, maximizing 2's payoff.³²

In the Online Appendix we show that the results are similar whether the ownership structure is chosen to maximize joint surplus or country 1's payoff. 1:1 maximizes both countries' investments when 2 has completed the restoration, $\mu_2 = 0$, and is sufficiently dispensable, $\lambda_2 \geq \mu_1$, maximizing the joint surplus and also 1's payoff because 1 obtains more than half of the surplus in Nash bargaining. Similarly, 2:1 is optimal under both welfare criteria when 1 is indispensable, $\lambda_1 = 0$, and 2 is sufficiently indispensable, $\lambda_2 \leq \mu_1$. Accordingly, Proposition 2 is robust to this alternative welfare criterion.

As for Proposition 4, the results are qualitatively similar. 2:2 maximizes 1's payoff if $\lambda_2 \leq \mu_1$, $\lambda_1 \in [\underline{\lambda}', \min\{\mu_2, \bar{\lambda}'\}]$ and $(\Theta_1 + \Theta_2) - (\theta_1 + \theta_2)$ is sufficiently small. However, there is an additional constraint that $\mu_1 > 0$ is sufficiently small to guarantee that $0 < \underline{\lambda}' < \bar{\lambda}' < 1$. This is because optimality of 2:2 involves a tradeoff. 2:2 increases y_2 relative to 2:1 at the expense of lower y_1 .

³⁰ Similarly, Rasul (2006) analyzes how child custody after divorce should be allocated in the child's best interests, maximizing the spousal investments into child quality.

³¹ Furthermore, one could consider a corrective penalty to the host country. Such lump sum transfer would, however, have no effect on investment incentives.

³² $J:1$ also maximizes 2's investment. Although 1's investment is minimal, 2 obtains maximal share of the value of 1's investment.

Suppose $\mu_1 \approx 0$ so that the additional constraint is satisfied and, furthermore, $\lambda_1 \geq \underline{\lambda}'$. Then 1's share of the value of her investment in Nash bargaining is approximately half, while she gets a much larger share of y_2 .³³ That is why the increase in y_2 has a larger effect on 1's payoff than the reduction in y_1 – and thus 2:2 maximizes 1's payoff under qualitatively similar conditions to Proposition 4.

6 Restitution cases

6.1 Common arguments in restitution debate

Restitution of cultural goods to their country of origin is a fiercely debated topic. Source countries, armed with historical and moral reasons have requested the return of cultural property. Host countries, on the other hand, have in many cases rejected such requests based on legal and historical grounds as well as arguing that the source country does not have sufficient capacity to house, protect, study and display the cultural good. For example, in the case of the Icelandic manuscripts, the largest restitution of cultural goods to day, Iceland's request for their return was primarily based on historical and moral grounds. The manuscripts were seen as a central part of Icelandic cultural identity and their return as an issue of utmost importance. In the words of a leading modern Icelandic historian, *"next to the issues of fishing boundaries around and the defense of Iceland itself, the return of the manuscripts [was] the biggest and most serious problem in the foreign relations of independent Iceland"* (Nielsen, 2002, p. 5). Furthermore, Iceland claimed that Denmark had a moral obligation to return the manuscripts, especially after the ending of the monarchical union with Denmark in 1944. Opponents of the return argued that the manuscripts constituted a pan-Scandinavian heritage and that Iceland had no legal claim to them. They also claimed that Iceland lacked both the technical resources to conserve the manuscripts and scholarly resources to

³³ Under 2:1, 1's bargaining payoff is $\frac{1}{2}[(\Theta_1 + \Theta_2) + (\Theta_1 - \Theta_2)\mu_1](y_1)^{\frac{1}{2}} + \frac{1}{2}[(\Theta_1 + \Theta_2) + (\Theta_1 - \Theta_2)\lambda_1](y_2)^{\frac{1}{2}}$.

study and publish them, while Copenhagen was a recognized centre for Old Norse studies (Greenfield, 2007, p. 21).

Similar arguments have also been presented in the most famous amongst restitution cases – the Parthenon marbles located in the British Museum. The main argument for restitution has been that the marbles are an important part of Greek cultural heritage that were removed by Lord Elgin at a time when Greece was under Ottoman control and under dubious circumstances. The British Museum’s response has been that the Parthenon marbles had been legally acquired by Lord Elgin and that the museum’s trustees do not have the right to dispose of any objects. The British Museum had also argued in the past that Greece lacked a suitable place to house them and, furthermore, the Greek authorities could not properly take care of them – arguments that have lost their relevance since the opening of the new Acropolis Museum in 2009.

While the case of the Parthenon marbles remains at standstill, significant progress has recently been made in another long-standing restitution case, that of the Benin bronzes. The Benin bronzes were taken by British forces in 1897, following a punitive expedition. The importance of these objects to the Edo people – the descendants of the founders of the ancient Kingdom of Benin – cannot be underestimated. According to Godwin Nogheghase Obaseki, the governor of the Edo state, *"these works of art embody what we are: our people, our culture, our religion, also part of our political structure, they are symbols of our identity."*³⁴ Opponents of the return have argued that Nigeria does not have the necessary resources to adequately take care of them. However, even museums with significant Benin bronze collections, such as the British Museum, no longer take this position in opposing the restitution of the Benin bronzes.

This paper introduces a novel economic argument to the restitution debate. We explore what ownership arrangement maximizes the overall investments in

³⁴ Mükke, Lutz and Maria Wiesner. 2018. "Die Beute Bronzen." *Frankfurter Allgemeine Zeitung*, January 15. <https://www.faz.net/aktuell/gesellschaft/kriminalitaet/benin-die-beute-bronzen-15359996.html>. Accessed 2021-12-08.

the protection and restoration as well as the display and study of the cultural good. In other words, we analyze the ownership arrangement that is in the best interests of the cultural good itself. UNESCO defines cultural property as *"historical and ethnographical objects and documents including manuscripts, works of the plastic and decorative arts, paleontological and archaeological objects and zoological, botanical and mineralogical specimens"* (UNESCO, 2001, p. 9). In essence, cultural goods are public goods. Applying the property rights theory to ownership and location of cultural goods provides a framework that allows us not only to analyze restitution but is rich enough to examine the various forms it can take, including a long-term loan.

The value that different countries place on the cultural good is an important determinant for restitution in our model. This is consistent with the reasoning of UNESCO's Intergovernmental Committee for the Return of Cultural Property, the main body dealing with restitution claims from source countries. It takes an active role in resolving restitution claims by mediating between source and host countries. The committee's role is to evaluate the claim and recommend return if the cultural good is *"highly charged with cultural (or natural) significance ... the removal of [such an] object from its original cultural context irrevocably divests that culture of one of its dimensions"* (Greenfield, 2007, p. 365).

Greenfield (2007), a leading authority, uses a similar argument when calling for the return of cultural goods to their country of origin. According to her *"... cultural property is most important to the people who created it or for who it was created or whose particular identity and history it is bound with. This cannot be compared with the scholastic or even inspirational influence on those who merely acquire such objects or material"* (Greenfield, 2007, p. 411). In terms of our model, we argue that this is consistent with Θ_1 being significantly greater than θ_2 . Greenfield calls for the return of (i) historic records or manuscripts of a nation, (ii) objects torn from immovable property and (iii) paleontological materials.

Consistent with these arguments, Proposition 3 finds that restitution is optimal when Θ_1 is sufficiently high or θ_2 is sufficiently low. The form of

restitution, however, depends on technological factors. In what follows, we apply our theoretical results to two significant restitution cases – the Icelandic manuscripts and the Benin bronzes.

6.2 The Icelandic manuscripts

The Icelandic manuscripts, made of vellum or paper, hold the medieval saga literature of Iceland, and were collected for the most part by Icelander Árni Magnússon in the early 18th century.³⁵ A professor at the University of Copenhagen (then the only university serving Iceland, being part of the Danish kingdom), Magnússon was sent to Iceland to compile a register of its farms and estates. Being a keen antiquarian, he used his spare time to search the country for manuscripts, which he either bought or copied. He continued to add to this collection, and though two thirds were destroyed by fire in 1728, the collection was still large when left to the university after his death in 1730 (Greenfield, 2007, p. 13-15).

Beginning in the 19th century, requests were made for the manuscripts' return to Iceland, and on the country's independence in 1944 the campaign became an uppermost priority. Finally in 1971, after much wrangling, a Danish law was ratified which required that all manuscripts held to be 'Icelandic cultural property' would be returned to Iceland. These were generally defined as works composed or translated by an Icelander, whose content was wholly or predominantly concerned with Iceland. A committee of two Danish and two Icelandic scholars decided which manuscripts satisfied these conditions.³⁶

Iceland was clearly the country which valued the manuscripts most. Desire for their return had been a running theme throughout Iceland's path to independence, and when the first manuscripts finally arrived in the country it was a national event. *"Shops and schools were closed. The whole nation ... was*

³⁵ Denmark's interest in Icelandic manuscripts began more than a century earlier and intensified in the 17th century, during which important manuscripts such as *Flateyjarbók* and *Codex Regius* were collected (Kapitan, 2022, p. 321-323).

³⁶ In total, 1,666 manuscripts from the Arnarnagnæan collection and 141 from the Royal Library of Denmark were returned to Iceland (Nielsen, 2002, p. 4). The first manuscripts were sent to Iceland in 1971 and the final ones arrived in 1997.

listening to the radio or watching television for a live account of the historic event which was taking place" (Greenfield, 2007, p. 1).

According to Proposition 4, host country ownership and location, 2:2, can be optimal when the host country is relatively indispensable and the spillover from its investment is large. We argue that both conditions were initially satisfied in the case of the Icelandic manuscripts. Denmark was relatively indispensable due to its expertise in studying and publishing manuscripts and it was precisely for this reason that Icelandic bishops, prior to Magnússon, sent some of their most important manuscripts, such as *Flateyjarbók*, to the king of Denmark (Greenfield, 2007, p. 13). Furthermore, the spillover from Denmark's investment was large both initially – when scholarly efforts were primarily centered on translating and publishing the manuscripts (Kapitan, 2022) – and later – when the focus shifted towards restoration and conservation.

Proposition 4 also requires that the source country be moderately indispensable. Initially, Iceland was fairly indispensable due to limited knowledge of Old Norse-Icelandic – the language of the manuscripts – in 17th century Denmark (Kapitan, 2022, p. 321).³⁷ However, it was less than fully indispensable due to its limited expertise in editing and publishing medieval manuscripts. Ownership and location of the manuscripts by Denmark would then be optimal if, additionally, the value of given investments was not significantly reduced by their location in Denmark. We argue that this condition was also satisfied as the manuscripts were not damaged by their relocation to Denmark.

The return of the Icelandic manuscripts, a process which started in 1971 and only completed in 1997, took the form of full restitution. According to our results, full restitution is optimal when the host country completes restoration and no longer has indispensable expertise. Denmark's investment in restoration was largely completed by the time the manuscripts were returned to Iceland.³⁸ Furthermore, through close cooperation between the two sides – the

³⁷ In addition to translators, Iceland's contribution also included skilled scribes that could transcribe the manuscripts into readable scripts (Jucknies, 2004, p.3). Icelandic bishops played an active role in this process by expending resources on collecting as well as transcribing manuscripts (Jónsson, 1998).

³⁸ The manuscripts have been through extensive conservation work more than once since

Árni Magnússon Institute for Icelandic Studies in Reykjavik and the Arnarnag-næan Institute at the University of Copenhagen – Iceland developed expertise to further study, publish and conserve the manuscripts, making Denmark relatively dispensable.³⁹ Therefore, full restitution provides the best incentives to invest in the manuscripts.

6.3 The Benin bronzes

The Benin bronzes are a collection of sculptures and plaques – made of ivory, brass and wood – that once adorned the royal palace of the Oba, in the ancient Kingdom of Benin, now in modern-day Nigeria. The bronzes are the equivalent of the archives of the Kingdom of Benin as the Edo people did not use written language but instead recorded all important events on them.⁴⁰

In 1897, following a punitive expedition, Benin City was taken and the Benin bronzes looted by British forces. The artefacts ended up all over the world with the British Museum and the Ethnological Museum in Berlin possessing the largest collections, 950 and more than 500 pieces respectively.⁴¹

In 2007, the Benin Dialogue Group was formed to bring together the Nigerian government and the current Oba with a number of European museums

Árni Magnússon bequeathed his collection to the University of Copenhagen. However, some of the earlier work was unsatisfactory. For example, the paper used in the repairs was too stiff and also concealed some of the text. Moreover, the various conservation attempts produced an inhomogeneous collection. Subsequent conservation aimed at addressing these issues and was largely completed by the time the manuscripts left Denmark for Iceland (Jakobsen, 1996, p. 21-22).

³⁹ The two institutes cooperate closely through exchanging members of staff, publishing projects and summer schools. The relationship between the two sides is even older than both institutes and can be traced back to Árni Magnússon's will in 1730. In his will, Magnússon bequeathed his wealth to fund scholarships for Icelandic philologists, historians and literary researchers for studies at the collections and archives housed by the University of Copenhagen (<https://arnamagnaeanskekommission.ku.dk/om/>). A number of current and former researchers of the Árni Magnússon Institute are among the recipients of this award, including some of the institute's former directors.

⁴⁰ Mükke, Lutz and Maria Wiesner. 2018. "Die Beute Bronzen." *Frankfurter Allgemeine Zeitung*, January 15. <https://www.faz.net/aktuell/gesellschaft/kriminalitaet/benin-die-beute-bronzen-15359996.html>. Accessed 2021-12-08.

⁴¹ For a detailed list of museums across the world holding Benin bronzes see <https://digitalbenin.org/institutions>. Accessed 2023-03-29.

holding Benin bronzes to find a compromise that would allow some of these to return to Benin City.⁴² In 2018, an agreement was reached by which the European museums would lend some of the artefacts to Nigeria on a rotating basis.⁴³ The loaned Benin bronzes would be exhibited in the yet to be built Edo Museum for West African Art in Benin City. However, in 2022, five German museums, including the Ethnological Museum in Berlin, went further and agreed to return ownership of more than 512 Benin bronzes in their collections to Nigeria.⁴⁴

Return seems to be primarily motivated by a feeling among the Europeans that the Benin bronzes *"have become an embarrassment"*.⁴⁵ In terms of our model, θ_2 – host country's valuation for the cultural good located in their country – has reduced. A reduction in θ_2 leads to the return of the cultural good but whether loan or full restitution is optimal depends importantly on

⁴² A number of museums with Benin collections have participated in the Benin Dialogue Group, including the British Museum, the Ethnological Museum in Berlin, the National Museum of World Cultures in the Netherlands, the Museum of Archaeology and Anthropology of the University of Cambridge and the Pitt Rivers Museum of the University of Oxford. Museum am Rothenbaum, Kulturen und Künste der Welt (MARKK). 2019. "Statement from Benin Dialogue Group." July 5-7. <https://markk-hamburg.de/en/benin-dialogue/>. Accessed 2023-07-26.

⁴³ It should be noted that despite this agreement, Nigeria did not give up their claim for ownership of the Benin bronzes. Brown, Kate. 2018. "Europe's Largest Museums Will Loan Looted Benin Bronzes to Nigeria's Planned Royal Museum." *Artnet News*, October 22. <https://news.artnet.com/art-world/benin-dialogue-group-october-2018-1376824>. Accessed 2023-03-29

⁴⁴ Reuters. 2022. "Germany signs deal to give ownership of Benin Bronzes to Nigeria". 25 August. <https://www.reuters.com/world/europe/germany-signs-deal-give-ownership-benin-bronzes-nigeria-2022-08-25/> Accessed 2025-11-25. Similar agreements were subsequently made by a number of other museums with Benin bronzes, such as the Museum of Archaeology and Anthropology of the University of Cambridge which agreed to return ownership of the 116 artefacts in its possession (BBC. 2022. "Cambridge University to return Benin Bronzes to Nigeria." 14 December. <https://www.bbc.co.uk/news/uk-england-cambridgeshire-63973271>. Accessed 2023-08-03) and the Horniman Museum in London which returned ownership of its entire collection comprised of 72 artefacts (BBC. 2022. "Horniman Museum to return 72 artefacts to Nigeria." 7 August. <https://www.bbc.co.uk/news/uk-england-london-62456366>. Accessed 2023-08-04).

⁴⁵ A Nigerian negotiator described the eagerness of some of the Europeans to relocate the Benin bronzes to Nigeria in the following characteristic way: *"Quite frankly, if Obaseki set up a shed at the back of his house, they'd hand them over to him. Just to be rid of them."* BBC. 2020. "Nigeria's Opportunity for Return of Benin Bronzes." September 11. <https://www.bbc.co.uk/news/world-africa-54117905>. Accessed 2021-12-08.

how indispensable the parties are.

In the current era, it has become crucial for these artefacts to engage with their original cultural environment, thus making Nigeria indispensable. If the European museums are relatively indispensable, e.g. due to their extensive expertise in the conservation and exhibition of the Benin bronzes, return in the form of a loan – as initially agreed in 2018 – would maximize the investments in Benin bronzes according to Proposition 2(ii).⁴⁶ However, if the European museums are relatively dispensable, full restitution can be optimal. Sir David Adjaye, the architect of the planned museum, speaks of a different type of museum: "*It cannot happen as a kind of Western glass box, a vitrine, it would mean nothing, it would be totally disregarded by the community*" (Phillips, 2021, p. 292). If the European museums have a relatively dispensable role in such a museum, return in the form of full restitution – as agreed by Germany in 2022 – would provide maximal incentives to invest in Benin bronzes.

The return agreement between Nigeria and the German museums also stipulates that around a third of all Benin bronzes will remain in Germany on long-term loan, with the Nigerian authorities deciding which ones will remain. According to Obaseki, these artefacts will serve as 'ambassadors' for Nigeria as "*the rest of the world still needs to know about the Benin works.*"⁴⁷ As Proposition 7(i) shows, loan to the host country, 1:2, can be optimal for less significant cultural goods when the host country is moderately indispensable. We argue that this condition is broadly satisfied given the global reach of German museums, particularly the Ethnological Museum in Berlin.

⁴⁶ As part of the loan agreement, the European partners have also agreed to "*provide advice, as requested, in areas including building and exhibition design. European and Nigerian partners will work collaboratively to develop training, funding, and legal frameworks to facilitate the permanent display of Benin works of art in the new museum.*" Museum Volkenkunde. 2018. "Statement from Benin Dialogue Group." October 19. <https://www.volkenkunde.nl/en/about-volkenkunde/press/statement-benin-dialogue-group-0>. Accessed 2021-12-08.

⁴⁷ Spero, Josh and Aanu Adeoye. 2022. "The Benin Bronzes and the road to restitution." *Financial Times*, November 4. <https://www.ft.com/content/1b32105e-428a-49e8-b2f2-d3ba381c4c65>. Accessed 2023-04-03.

7 Conclusions

In this paper, we examine the issue of restitution of cultural goods to the source country. We take the position that the cultural good should be returned if that maximizes the overall investments in the cultural good, i.e. is in the best interests of the cultural good itself.

We show that restitution can be optimal due to the role of the source country, completion of restoration by the host country or relative valuations for the cultural good. The optimal form of restitution depends on technological factors. Full restitution is optimal if the host country's restoration is complete and, furthermore, the host is quite dispensable. We argue that both conditions are consistent with the restitution of the Icelandic manuscripts since restoration by Denmark was largely completed by the time the manuscripts were returned and Iceland had developed the necessary expertise, making Denmark dispensable.

Restitution in the form of a loan to the source country is optimal if, in addition to the host country being indispensable, the source country becomes indispensable. However, if the host country is relatively dispensable, full restitution that transfers also ownership can be optimal. These results throw light on the return of the Benin bronzes to Nigeria. We argue that Nigeria has become indispensable because of the importance of having the bronzes engaging with their original cultural environment. European museums could be considered indispensable due to their expertise or, alternatively, they may become more dispensable as there are plans to avoid 'the Western glass box' exhibition style. Optimal form of return depends critically on how dispensable European museums are.

Our model allows us to also examine less common forms of restitution, such as returning the cultural good to the source country under joint ownership. Although such an arrangement has received limited attention in the restitution debate, it has proved more popular among cultural institutions building up their collections, as the recent joint acquisition of two Rembrandt portraits by

the Louvre and the Rijksmuseum illustrates.⁴⁸

Our paper takes a novel economic approach to restitution of cultural goods. However, the issue of restitution is also political, especially for significant cultural treasures. An important direction for future work is to extend the analysis to include political considerations.

⁴⁸ A further example is the joint acquisition of two Titian paintings by the National Gallery and the National Galleries of Scotland in 2009 and 2012. Bailey, Martin. 2016. "France and Netherlands finalise €160m 'Rembrandt Treaty'." *The Art Newspaper*, February 3. <https://www.theartnewspaper.com/2016/02/03/france-and-netherlands-finalise-euro160m-rembrandt-treaty>. Accessed 2022-08-01

Appendix

Proof of Lemma 1.

(i) Under 1:1 the first-order condition (5) determines the unique $y_2^{1:1}$ that maximizes 2's payoff. Note that the second-order condition, $\frac{1}{2}(\Theta_1 + \Theta_2) v^{22}(12 | y_2^{1:1}) - \frac{1}{2}(\Theta_1 - \Theta_2) v^{22}(1 | y_2^{1:1}) < 0$, is satisfied since $(\Theta_1 + \Theta_2) > (\Theta_1 - \Theta_2)$ and by Assumption 3(iii) $v^{22}(12 | y_2^{1:1}) \leq v^{22}(1 | y_2^{1:1})$. Similarly under all the structures.

It follows from the first-order conditions (5) and (9) that

$$\begin{aligned} \frac{1}{2}(\Theta_1 + \Theta_2) v^2(12 | y_2^{1:1}) - \frac{1}{2}(\Theta_1 - \Theta_2) v^2(1 | y_2^{1:1}) = \\ \frac{1}{2}(\Theta_1 + \Theta_2) v^2(12 | y_2^{2:1}) - \frac{1}{2}(\Theta_1 - \Theta_2) v^2(2 | y_2^{2:1}) \end{aligned} \quad (23)$$

If $v^2(1 | y_2) > v^2(2 | y_2)$ for all y_2 , (23) is not satisfied for $y_2^{1:1} = y_2^{2:1}$ but the right-hand-side is greater than the left-hand-side. The right-hand-side can be reduced by increasing $y_2^{2:1}$ given concavity of the payoff function, restoring equality.⁴⁹ Note that this argument is independent of $y_1^{1:1}$ and $y_1^{2:1}$ since $\partial^2 v(12) / \partial y_1 \partial y_2 = \partial^2 v(i) / \partial y_1 \partial y_2 = 0$. This proves that $y_2^{1:1} \leq y_2^{2:1}$ if $v^2(1 | y_2) \geq v^2(2 | y_2)$ for all y_2 .

The first-order conditions (9) and (11) imply that

$$\begin{aligned} \frac{1}{2}(\Theta_1 + \Theta_2) v^2(12 | y_2^{2:1}) - \frac{1}{2}(\Theta_1 - \Theta_2) v^2(2 | y_2^{2:1}) = \\ \frac{1}{2}(\theta_1 + \theta_2) v^2(12 | y_2^{2:2}) - \frac{1}{2}(\theta_1 - \theta_2) v^2(2 | y_2^{2:2}) \end{aligned} \quad (24)$$

If $y_2^{2:1} = y_2^{2:2}$, (24) is satisfied if and only if $v^2(2 | y_2^{2:2}) = \theta^* v^2(12 | y_2^{2:2})$, where $\theta^* = \frac{(\Theta_1 + \Theta_2) - (\theta_1 + \theta_2)}{(\Theta_1 - \Theta_2) - (\theta_1 - \theta_2)} \in (0, 1)$ and $y_2^{2:2}$ satisfies (11). If $v^2(2 | y_2) > \theta^* v^2(12 | y_2)$ for all y_2 , the right-hand-side of (24) is greater than the left-hand-side. Equality then requires $y_2^{2:1} < y_2^{2:2}$ given concavity of 2's payoff function. Therefore, $y_2^{2:1} \leq y_2^{2:2}$ if $v^2(2 | y_2) \geq \theta^* v^2(12 | y_2)$ for all y_2 .

⁴⁹ While there exist multiple pairs of $(\hat{y}_2^{1:1}, \hat{y}_2^{2:1})$ that satisfy (23), they all have the property that $\hat{y}_2^{1:1} \leq \hat{y}_2^{2:1}$ if $v^2(1 | y_2) \geq v^2(2 | y_2)$ for all y_2 . However, by the first- and second-order conditions, there is a unique pair $(y_2^{1:1}, y_2^{2:1})$ that maximizes 2's payoff.

Finally, it is obvious from (11) and (13) that $y_2^{2:2} < y_2^{J:1}$.

Lemma 1 combines these rankings.

(ii) Under 1:1 the first-order condition (4) determines the unique $y_1^{1:1}$ that maximizes 1's payoff. The second-order condition, $\frac{1}{2}(\Theta_1 + \Theta_2)v^{11}(12|y_1^{1:1}) + \frac{1}{2}(\Theta_1 - \Theta_2)v^{11}(1|y_1^{1:1}) < 0$, is satisfied since $v^{11}(12) < 0, v^{11}(1) \leq 0$. Similarly under all the structures.

The first-order conditions (4) and (8) imply that

$$\begin{aligned} \frac{1}{2}(\Theta_1 + \Theta_2)v^1(12|y_1^{1:1}) + \frac{1}{2}(\Theta_1 - \Theta_2)v^1(1|y_1^{1:1}) = \\ \frac{1}{2}(\Theta_1 + \Theta_2)v^1(12|y_1^{2:1}) + \frac{1}{2}(\Theta_1 - \Theta_2)v^1(2|y_1^{2:1}) \end{aligned} \quad (25)$$

If $v^1(1|y_1) < v^1(2|y_1)$ for all y_1 , (25) is not satisfied for $y_1^{1:1} = y_1^{2:1}$ but the right-hand-side is greater than the left-hand-side. Concavity of the payoff function implies that $y_1^{1:1} < y_1^{2:1}$ for the equality to be satisfied. Thus, $y_1^{1:1} \leq y_1^{2:1}$ if $v^1(1|y_1) \leq v^1(2|y_1)$ for all y_1 .

It is obvious from (4) and (13) that $y_1^{J:1} \leq y_1^{1:1}$. (8) and (10) prove that $y_1^{2:1} > y_1^{2:2}$ since $(\Theta_1 + \Theta_2) > (\theta_1 + \theta_2)$ and $(\Theta_1 - \Theta_2) > (\theta_1 - \theta_2)$.

Q.E.D.

Proof of Proposition 2.

(i) If $v^2(1) = 0$, 1-ownership eliminates the negative second term in (5) and location in country 1 maximizes the first term. Therefore, y_2 is maximal under 1:1, $y_2^{1:1} = y_2^{J:1}$.

From Lemma 1(ii), $y_1^{1:1} \geq y_1^{2:1}$ if $v^1(1) \geq v^1(2)$, and furthermore, $y_1^{2:1} > y_1^{2:2}$ and $y_1^{1:1} \geq y_1^{J:1}$. Finally, we can obtain $y_1^{1:2}$ from (4) by replacing Θ_i by θ_i . Since this replacement reduces both the first and the second term in (4), it follows that $y_1^{1:1} > y_1^{1:2}$. Combining these inequalities, it follows that 1:1 maximizes y_1 if $v^1(1) \geq v^1(2)$.

In sum, 1:1 is optimal if $v^2(1) = 0$ and $v^1(1) \geq v^1(2)$ since both countries' investments are maximal.

(ii) If $v^2(2) = 0$, 2-ownership eliminates the negative second term in (9) and y_2 is maximal under 2:1, $y_2^{2:1} = y_2^{J:1}$.

From Lemma 1(ii) and part (i) of this proof, it follows that y_1 is maximal under 2:1 if $v^1(1) \leq v^1(2)$.

Therefore, $v^2(2) = 0$ and $v^1(1) \leq v^1(2)$ are sufficient conditions for 2:1 to maximize the surplus.

Q.E.D.

Proof of Proposition 4.

Substituting $v^i(12) = \frac{1}{2}(y_i)^{-\frac{1}{2}}$, $v^1(1) = \frac{1}{2}\lambda_2(y_1)^{-\frac{1}{2}}$ and $v^2(1) = \frac{1}{2}\mu_2(y_2)^{-\frac{1}{2}}$ in (4) and (5), we obtain

$$y_1^{1:1} = \frac{1}{16} [(\Theta_1 + \Theta_2) + (\Theta_1 - \Theta_2) \lambda_2]^2, \quad (26)$$

$$y_2^{1:1} = \frac{1}{16} [(\Theta_1 + \Theta_2) - (\Theta_1 - \Theta_2) \mu_2]^2. \quad (27)$$

Therefore, surplus under 1:1 is equal to

$$\begin{aligned} S^{1:1} &= \frac{1}{2} (\Theta_1 + \Theta_2)^2 + \frac{1}{4} (\Theta_1 + \Theta_2) (\Theta_1 - \Theta_2) (\lambda_2 - \mu_2) - \frac{1}{16} [(\Theta_1 + \Theta_2) + (\Theta_1 - \Theta_2) \lambda_2]^2 \\ &\quad - \frac{1}{16} [(\Theta_1 + \Theta_2) - (\Theta_1 - \Theta_2) \mu_2]^2 \\ &= \frac{3}{8} (\Theta_1 + \Theta_2)^2 + \frac{1}{8} (\Theta_1 + \Theta_2) (\Theta_1 - \Theta_2) (\lambda_2 - \mu_2) - \frac{1}{16} (\Theta_1 - \Theta_2)^2 [(\lambda_2)^2 + (\mu_2)^2] \end{aligned} \quad (28)$$

By similar calculations,

$$S^{2:1} = \frac{3}{8} (\Theta_1 + \Theta_2)^2 + \frac{1}{8} (\Theta_1 + \Theta_2) (\Theta_1 - \Theta_2) (\mu_1 - \lambda_1) - \frac{1}{16} (\Theta_1 - \Theta_2)^2 [(\mu_1)^2 + (\lambda_1)^2] \quad (29)$$

$$S^{2:2} = \frac{3}{8} (\theta_1 + \theta_2)^2 + \frac{1}{8} (\theta_1 + \theta_2) (\theta_1 - \theta_2) (\mu_1 - \lambda_1) - \frac{1}{16} (\theta_1 - \theta_2)^2 [(\mu_1)^2 + (\lambda_1)^2] \quad (30)$$

$$S^{J:1} = \frac{3}{8} (\Theta_1 + \Theta_2)^2 \quad (31)$$

$$S^{1:2} = \frac{3}{8} (\theta_1 + \theta_2)^2 + \frac{1}{8} (\theta_1 + \theta_2) (\theta_1 - \theta_2) (\lambda_2 - \mu_2) - \frac{1}{16} (\theta_1 - \theta_2)^2 [(\lambda_2)^2 + (\mu_2)^2] \quad (32)$$

Step 1. Note that $v^i(i) = \lambda_j v^i(12)$ and $v^j(i) = \mu_j v^j(12)$. Therefore, it is straightforward that $y_1^{2:\ell} \geq y_1^{1:\ell}$ for $\ell = 1, 2$ if and only if $\mu_1 \geq \lambda_2$ and $y_2^{2:\ell} \geq y_2^{1:\ell}$ for $\ell = 1, 2$ if and only if $\mu_2 \geq \lambda_1$. Thus, $S^{2:2} \geq S^{1:2}$ and $S^{2:1} \geq S^{1:1}$ if $\mu_1 \geq \lambda_2$ and $\mu_2 \geq \lambda_1$. 2:2 is therefore optimal if additionally $S^{2:2} \geq \max \{S^{J:1}, S^{2:1}\}$. We will establish that in Steps 2 and 3.

Step 2. Suppose initially that $(\Theta_1 + \Theta_2) = (\theta_1 + \theta_2) = \sigma$. Denote $\Delta = (\Theta_1 - \Theta_2)$ and $\delta = (\theta_1 - \theta_2) < \Delta$.

From (30) and (31), $S^{2:2} \geq S^{J:1}$ if and only if

$$\begin{aligned} \frac{1}{8} \sigma \delta (\mu_1 - \lambda_1) - \frac{1}{16} \delta^2 [(\mu_1)^2 + (\lambda_1)^2] &\geq 0 \\ f(\lambda_1, \mu_1) = \sigma (\mu_1 - \lambda_1) - \frac{1}{2} \delta [(\mu_1)^2 + (\lambda_1)^2] &\geq 0 \end{aligned} \quad (33)$$

From (29) and (30), $S^{2:2} \geq S^{2:1}$ if and only if

$$\begin{aligned} \frac{1}{8} \sigma \delta (\mu_1 - \lambda_1) - \frac{1}{16} \delta^2 [(\mu_1)^2 + (\lambda_1)^2] &\geq \frac{1}{8} \sigma \Delta (\mu_1 - \lambda_1) - \frac{1}{16} \Delta^2 [(\mu_1)^2 + (\lambda_1)^2] \\ \frac{1}{8} \sigma (\Delta - \delta) (\mu_1 - \lambda_1) - \frac{1}{16} (\Delta^2 - \delta^2) [(\mu_1)^2 + (\lambda_1)^2] &\leq 0 \\ g(\lambda_1, \mu_1) = \sigma (\mu_1 - \lambda_1) - \frac{1}{2} (\Delta + \delta) [(\mu_1)^2 + (\lambda_1)^2] &\leq 0 \end{aligned} \quad (34)$$

From standard properties of a quadratic function, $f(\lambda_1, \mu_1)$ and $g(\lambda_1, \mu_1)$ obtain their maximum value for $\lambda_1 < 0$ and $\partial g / \partial \lambda_1 < 0$, $\partial f / \partial \lambda_1 < 0$ for all $\lambda_1 \in [0, 1]$.

First, suppose $\mu_1 = 0$. Since $f(0, 0) = 0$ and $\partial f / \partial \lambda_1 < 0$, $f(\lambda_1, 0) < 0$ for all $\lambda_1 \in (0, 1]$ and 2:2 cannot be optimal.

Then, consider $\mu_1 > 0$. Note that then $g(0, \mu_1) > 0$ since $\sigma > \Delta$. Therefore, since $\partial g / \partial \lambda_1 < 0$, there exists $\underline{\lambda} > 0$ such that $g(\lambda_1, \mu_1) \leq 0$ if and only if $\lambda_1 \geq \underline{\lambda}$.

Note that $f(\lambda_1, \mu_1) > g(\lambda_1, \mu_1)$. Therefore, there exists $\bar{\lambda} > \underline{\lambda}$ such that

$f(\lambda_1, \mu_1) \geq 0$ if and only if $\lambda_1 \leq \bar{\lambda}$. Therefore, assuming $(\Theta_1 + \Theta_2) = (\theta_1 + \theta_2)$ and $\mu_1 > 0$, $S^{2:2} \geq \max \{S^{J:1}, S^{2:1}\}$ if and only if $\lambda_1 \in [\underline{\lambda}, \bar{\lambda}]$.

Finally, we verify that $\bar{\lambda} < 1$. It is obvious from (30) and (31) that $\lambda_1 < \mu_1$ is a necessary condition for $S^{2:2} \geq S^{J:1}$ and thus for $f(\lambda_1, \mu_1) \geq 0$. Therefore, $\bar{\lambda} < \mu_1 \leq 1$.

Step 3. Now allow for $(\Theta_1 + \Theta_2) > (\theta_1 + \theta_2)$ by increasing Θ_i . $\partial S^{J:1} / \partial \Theta_i > 0$ and $\partial S^{2:1} / \partial \Theta_i > 0$ while $\partial S^{2:2} / \partial \Theta_i = 0$. Therefore 2:2 can remain optimal for sufficiently small increase in Θ_i . Define $\bar{\Theta}$ such that $S^{2:2} = \max \{S^{J:1}, S^{2:1}\}$ if $(\Theta_1 + \Theta_2) - (\theta_1 + \theta_2) = \bar{\Theta}$ and $\lambda_1 \in [\underline{\lambda}, \bar{\lambda}]$. Then, $S^{2:2} \geq \max \{S^{J:1}, S^{2:1}\}$ if and only if $\lambda_1 \in [\underline{\lambda}, \bar{\lambda}]$, $\mu_1 > 0$ and $(\Theta_1 + \Theta_2) - (\theta_1 + \theta_2) < \bar{\Theta}$. Furthermore, in Step 1 we established that $S^{2:2} \geq S^{1:2}$ and $S^{2:1} \geq S^{1:1}$ if $\mu_1 \geq \lambda_2$ and $\mu_2 \geq \lambda_1$. Proposition 4 combines these conditions.

Q.E.D.

Proof of Proposition 5.

Assume $\lambda_1 = 0$. $S^{2:1} \geq S^{J:1}$ since $y_2^{2:1} = y_2^{J:1}$ if $\lambda_1 = 0$ (see (9) and (14) for $v^2(2) = 0$) and $y_1^{2:1} \geq y_1^{J:1}$ for all parameter values (see (8) and (14)). Equation (12) simplifies to $\lambda_1 > \theta^*$ in our parametric example and thus cannot be satisfied for $\lambda_1 = 0$. Therefore, both $y_2^{2:1} > y_2^{2:2}$ and $y_1^{2:1} > y_1^{2:2}$ and accordingly, $S^{2:1} > S^{2:2}$.

Next we will compare 1:1 and 2:1. From (28) and (29) and setting $\lambda_1 = 0$,

$$\begin{aligned} S^{1:1} - S^{2:1} &= \frac{1}{8}(\Theta_1 + \Theta_2)(\Theta_1 - \Theta_2)(\lambda_2 - \mu_2) - \frac{1}{16}(\Theta_1 - \Theta_2)^2 [(\lambda_2)^2 + (\mu_2)^2] \\ &\quad - \frac{1}{8}(\Theta_1 + \Theta_2)(\Theta_1 - \Theta_2)\mu_1 + \frac{1}{16}(\Theta_1 - \Theta_2)^2(\mu_1)^2. \end{aligned} \quad (35)$$

Using the notation from the proof of Proposition 4, we obtain

$$S^{1:1} - S^{2:1} = \frac{1}{8}\sigma\Delta(\lambda_2 - \mu_2) - \frac{1}{16}\Delta^2 [(\mu_2)^2 + (\lambda_2)^2] - \frac{1}{8}\sigma\Delta\mu_1 + \frac{1}{16}\Delta^2(\mu_1)^2. \quad (36)$$

Therefore $S^{1:1} \geq S^{2:1}$ if and only if

$$h(\lambda_2, \mu_1, \mu_2) = (\lambda_2 - \mu_1) \left[\sigma - \frac{1}{2} \Delta(\lambda_2 + \mu_1) \right] - \mu_2(\sigma + \frac{1}{2} \Delta \mu_2) \geq 0. \quad (37)$$

Let us examine the properties of $h(\lambda_2, \mu_1, \mu_2)$. By standard calculations, $\partial h / \partial \lambda_2 > 0$ for relevant parameter values. Therefore, if $h(1, \mu_1, \mu_2) > 0$, there exist a range of values of $\lambda_2 \in (\hat{\lambda}, 1]$ for which $h(\lambda_2, \mu_1, \mu_2) > 0$. If $\lambda_2 = \mu_1$, $h(\lambda_2, \mu_1, \mu_2) < 0$ by (37). Therefore, $\hat{\lambda} > \mu_1$.

When is $h(1, \mu_1, \mu_2) > 0$? By standard calculations, $h(1, 1, 1) = -(\sigma + \frac{1}{2} \Delta) < 0$ and $h(1, 0, 0) = \sigma - \frac{1}{2} \Delta > 0$. Since $\partial h / \partial \mu_i < 0$ for $i = 1, 2$, there exists μ' such that $h(1, \mu_1, \mu_2) > 0$ if and only if $\mu_2 < \mu'$, where $\partial \mu' / \partial \mu_1 < 0$. $\mu' < 1$ since even for minimum $\mu_1 = 0$ μ_2 cannot equal 1 as $h(1, 0, 1) = -\Delta < 0$. $\mu' > 0$ if and only if $\mu_1 < \tilde{\mu}$, where $\tilde{\mu} < 1$, since $h(1, 1, \mu_2) < 0$ for all $\mu_2 \in (0, 1]$ given $h(1, 1, 0) = 0$.

Therefore, we have proved that given $\lambda_1 = 0$ $S^{1:1} \geq S^{2:1}$ if and only if $\lambda_2 \in (\hat{\lambda}, 1]$, $\mu_1 \in [0, \tilde{\mu})$ and $\mu_2 \in [0, \mu')$, where $\hat{\lambda} > \mu_1$ and $\max\{\mu', \tilde{\mu}\} < 1$.

Finally, let us compare 1:1 and 1:2. From (28) and (32), assuming $(\Theta_1 + \Theta_2) = (\theta_1 + \theta_2)$, $S^{1:1} \geq S^{1:2}$ if and only if $g(\mu_2, \lambda_2) \geq 0$ (see (34)). Following the proof of Proposition 4, $g(\mu_2, \lambda_2) \geq 0$ is satisfied if and only if $\mu_2 \in [0, \underline{\mu}]$. Finally, taking into account that $(\Theta_1 + \Theta_2) > (\theta_1 + \theta_2)$, $\mu_2 \in [0, \underline{\mu}]$ is a sufficient condition for $S^{1:1} \geq S^{1:2}$.

In sum, we have proved that 1:1 is optimal given $\lambda_1 = 0$ if $\lambda_2 \in (\hat{\lambda}, 1]$, $\mu_1 \in [0, \tilde{\mu})$ and $\mu_2 \in [0, \hat{\mu})$, where $\hat{\lambda} > \mu_1$, $\tilde{\mu} < 1$ and $\hat{\mu} = \min\{\mu', \underline{\mu}\} < 1$.

Q.E.D.

Proof of Proposition 6.

(i) Let us first compare $J:1$ and $2:2$. If $\mu_1 = 0$, $y_1^{J:1} = y_1^{2:1} > y_1^{2:2}$ and $S^{J:1} > S^{2:2}$ since $J:1$ maximizes y_2 . If $\mu_1 > 0$, we can employ Step 2 of the proof of Proposition 4. It showed that $S^{J:1} \geq S^{2:2}$ if and only if $f(\lambda_1, \mu_1) \leq 0$ and the condition is satisfied if and only if $\lambda_1 \in [\bar{\lambda}, 1]$. Step 2 assumed $(\Theta_1 + \Theta_2) = (\theta_1 + \theta_2)$. Allowing for $(\Theta_1 + \Theta_2) > (\theta_1 + \theta_2)$, $\lambda_1 \in [\bar{\lambda}, 1]$ is a sufficient condition for $S^{J:1} \geq S^{2:2}$.

From (31) and (32), assuming $(\Theta_1 + \Theta_2) = (\theta_1 + \theta_2)$, $S^{J:1} \geq S^{1:2}$ if and only if

$$\sigma(\lambda_2 - \mu_2) - \frac{1}{2}\delta[(\lambda_2)^2 + (\mu_2)^2] \leq 0. \quad (38)$$

(38) is equivalent to $f(\mu_2, \lambda_2) \leq 0$, see (33). Following the proof of Proposition 4, $f(\mu_2, \lambda_2) \leq 0$ if and only if $\mu_2 \in [\bar{\mu}, 1]$. Taking into account that $(\Theta_1 + \Theta_2) > (\theta_1 + \theta_2)$ $\mu_2 \in [\bar{\mu}, 1]$ is a sufficient condition for $S^{J:1} \geq S^{1:2}$.

Comparing $J:1$ and $1:1$ we obtain an inequality similar to (38) where δ is replaced by Δ . Therefore, $\mu_2 \in [\mu'', 1]$ is a sufficient condition for $S^{J:1} \geq S^{1:1}$, where $\mu'' < \bar{\mu}$ since $\Delta > \delta$. In a similar manner we can prove that $\lambda_1 \in [\lambda', 1]$ is a sufficient condition for $S^{J:1} \geq S^{2:1}$, where $\lambda' < \bar{\lambda}$.

In sum, $J:1$ is optimal if $\lambda_1 \in [\bar{\lambda}, 1]$ and $\mu_2 \in [\bar{\mu}, 1]$.

(ii) **Step 1.** From the proof of Proposition 4, $y_1^{2:\ell} \leq y_1^{1:\ell}$ for $\ell = 1, 2$ if and only if $\mu_1 \leq \lambda_2$ and $y_2^{2:\ell} \leq y_2^{1:\ell}$ for $\ell = 1, 2$ if and only if $\mu_2 \leq \lambda_1$. Thus, $S^{1:2} \geq S^{2:2}$ and $S^{1:1} \geq S^{2:1}$ if $\mu_1 \leq \lambda_2$ and $\mu_2 \leq \lambda_1$. $1:2$ is therefore optimal if additionally $S^{1:2} \geq \max\{S^{J:1}, S^{1:1}\}$. We will establish that in steps 2 and 3.

Step 2. Suppose initially that $(\Theta_1 + \Theta_2) = (\theta_1 + \theta_2)$. From (31) and (32), we can establish that $S^{1:2} \geq S^{J:1}$ if and only if $f(\mu_2, \lambda_2) \geq 0$. From (28) and (32) $S^{1:2} \geq S^{1:1}$ if and only if $g(\mu_2, \lambda_2) \leq 0$. Therefore, we can employ Step 2 of the proof of Proposition 4. Assuming $(\Theta_1 + \Theta_2) = (\theta_1 + \theta_2)$ and $\lambda_2 > 0$, $S^{1:2} \geq \max\{S^{J:1}, S^{1:1}\}$ if and only if $\mu_2 \in [\underline{\mu}, \bar{\mu}]$.

Step 3. As in the proof of Proposition 4, we define $\tilde{\Theta}$ such that $S^{1:2} = \max[S^{J:1}, S^{1:1}]$ if $(\Theta_1 + \Theta_2) - (\theta_1 + \theta_2) = \tilde{\Theta}$ and $\mu_2 \in [\underline{\mu}, \bar{\mu}]$. Combining the conditions from all the steps, $1:2$ is optimal if $\mu_2 \in [\underline{\mu}, \min\{\bar{\mu}, \lambda_1\}]$, $\lambda_2 \geq \mu_1$ and $(\Theta_1 + \Theta_2) - (\theta_1 + \theta_2) < \tilde{\Theta}$.

Q.E.D.

Proof of Proposition 7.

The first-order conditions are the same as in the main model. The only difference is that by Assumption 1" location in the host country is efficient for given investments, $(\theta_1 + \theta_2) > (\Theta_1 + \Theta_2)$.

(i) If $v^2(1) = 0$, 1-ownership eliminates 2's negative bargaining effect and y_2 is maximal under 1:2 since $(\theta_1 + \theta_2) > (\Theta_1 + \Theta_2)$ by Assumption 1".

From (4) and (8), 1-ownership maximizes 1's investment for given location if $v^1(1) \geq v^1(2)$. Then we compare $y_1^{1:1}$, determined by (4), to $y_1^{1:2}$, obtained from (4) by replacing Θ_i by θ_i . It follows that $y_1^{1:2} \geq y_1^{1:1}$ if $v^1(1) \leq \theta^{**}v^1(12)$, where $\theta^{**} = \frac{(\theta_1 + \theta_2) - (\Theta_1 + \Theta_2)}{(\Theta_1 - \Theta_2) - (\theta_1 - \theta_2)} \in (0, 1)$. Proposition 7(i) combines these conditions to $v^1(2) \leq v^1(1) \leq \theta^{**}v^1(12)$.

(ii) If $v^2(2) = 0$, 2-ownership eliminates 2's negative bargaining effect and y_2 is maximal under 2:2 given $(\theta_1 + \theta_2) > (\Theta_1 + \Theta_2)$.

From (4) and (8), 2-ownership maximizes 1's investment for given location if $v^1(2) \geq v^1(1)$. Furthermore, from (8) and (10) $y_1^{2:2} \geq y_1^{2:1}$ if $v^1(2) \leq \theta^{**}v^1(12)$. Proposition 7(ii) combines these conditions for 1's maximal investment under 2:2 to $v^1(1) \leq v^1(2) \leq \theta^{**}v^1(12)$.

Q.E.D.

Proof of Proposition 8.

(i) Under Assumption 1" 2:2 maximizes the positive bargaining effect and eliminates the negative bargaining effect if $v^2(2) = v^2(12)$ and $v^1(2) = 0$. Location in country 1 cannot achieve the same if $v^1(1) < v^1(12)$ and $v^2(1) > 0$. Thus, if $(\Theta_1 + \Theta_2) - (\theta_1 + \theta_2)$ is sufficiently small, 2:2 maximizes surplus.

(ii) 1:2 maximizes the positive bargaining effect and eliminates the negative bargaining effect if $v^2(1) = v^2(12)$ and $v^1(1) = 0$. Location in country 1 cannot achieve the same if $v^1(2) < v^1(12)$ and $v^2(2) > 0$. It follows that 2:2 maximizes surplus if $(\Theta_1 + \Theta_2) - (\theta_1 + \theta_2)$ is sufficiently small.

Q.E.D.

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