National Institute Economic Review (2021), 255: 1, 69–78
doi:10.1017/nie.2020.50

NIER CAMBRIDGE UNIVERSITY PRESS

ARTICLE

HOW LONG DOES ECONOMIC INJUSTICE LAST?

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This article assesses whether economic injustices that took place in the past still have significant implications for the material welfare of people many years later. That issue is central to the question of how fair is the distribution of wealth and income today. It is also relevant to issues of reparations for past wrongs. I find that in standard neoclassical models of economic growth the lingering effects of injustice from more than 70 years ago are generally small. But effects can last much longer once we allow for impacts of past injustices to be transmitted through human capital accumulation as well as physical capital.

Keywords: reparations; distributive justice.

JEL codes: P10; P14; O15

1. Introduction

Ask yourself this: how did I come to be as well off as I am? Was it partly through the inheritance of wealth that depends, to some extent, on the unjust acquisition of assets in the far past—maybe by an ancestor? Perhaps more likely—or at least more easily assessed—is that you shared in an economic environment that was richer and more successful than it might have been because some resources in the distant past had been acquired unfairly. Perhaps you are Belgian—or perhaps you are from the Democratic Republic of Congo. In either case, you might wonder how your standard of living today may even now reflect the lasting impact of assets being looted from the time of King Leopold II in the late nineteenth century.

How you answer these questions is fundamental to how you view the legitimacy of the distribution of incomes and wealth today. In order to answer them, one needs two things: first, a way to decide what makes acquisition of wealth and of income just, and what makes it unjust; second, we need a way of using that principle to estimate what fraction of wealth and income today is unjust because of past economic injustices. I want to use a rule put forward by Robert Nozick to provide the first of these things and then use calculations based on standard neoclassical models of economic growth to illustrate its implications for the scale of unfairness today [more technical details of the arguments developed in this paper are contained in Miles (2018)].

The question I set out to answer is one which has a profound effect on how one views the economic and social order today. I aim to assess the extent to which the levels of incomes and the stock of wealth in economies now are a direct result of the unjust acquisition of assets at some point in their (possibly distant) past. Those who view a large part of the incomes and assets that exist today, particularly within rich countries, as having come about because of unfair acquisition in the past—to be blunt 'theft'—will question the legitimacy of economic outcomes and see a powerful moral case for widespread redistribution through taxation and confiscation. Those who see a small impact now of what they might agree was unfair ownership of assets many decades ago will be less inclined towards redistributive taxation and see little reason for reparations from those whose ancestors might have enjoyed the fruits of ill-gotten gains but which have little impact on their resources today. That difference in view clearly separates those broadly on the right and the left in politics.

The basic idea I draw upon is straightforward. It rests on a notion that I think has great intuitive appeal, which is this: If I came by something fairly and willingly pass it on to someone else, then the recipient holds it fairly; but if I come by some asset unfairly, then the income from that asset, and the evolving value of the asset, remains a form of unjust resources. This is Nozick's principle of justice in acquisition (see Nozick [1974]). It means that if some assets have been acquired unjustly, the income derived from them is unjust, as is the ownership of assets acquired out of saving from that income. If we can trace through how income from unjust assets is used—and how the value of such assets evolves—we can keep track of what proportion of total assets and total income (GDP) is unjust. Tracing through how incomes and wealth (capital) evolve over time from some start point is exactly what models of economic growth do—the most famous of which remains the celebrated Solow model.

I rely on a central idea in Nozick's work, which is that how an allocation of resources came about is central to how we should judge its fairness. Simply looking at the distribution of resources will not reveal whether it can be judged as just or unjust. Equal distributions of assets brought about by unfair means can be unjust, while unequal distributions of resources brought about by means we might consider fair (e.g., exchange of assets willingly agreed on by people who legitimately owned them) can be just. This central idea is not uncontentious; see Sen (2009) for an extended discussion.

In essence, what the Nozick principle implies is that whatever distribution of resources arises from a just distribution by just steps is itself just. 'Just steps' means that I did not steal resources from someone else who had a legitimate claim on them and nor did I receive such illegitimately gained resources as a gift from anyone else.

I use versions of a neoclassical growth model (elaborations on Solow which allow for human capital as well as physical capital and different savings rates out of different sorts of income) to trace through the evolution of economic injustice over time.

To be more specific, the question I address is this: suppose at some point in the (possibly distant) past some proportion of the aggregate stock of productive assets in a country had been acquired unjustly and that subsequently those assets are not returned to their rightful owners. How does the stock of unjustly acquired assets, and the fraction of aggregate income that is unjust, then evolve over time as a result of this initial position? The answer depends on the rate at which such assets depreciate over time and also on what use is made of the income from such assets. Crucial to the question of whether initial injustice fades quickly or persists a long time is what proportion of the income from such assets is saved and used to accumulate new assets which, because they are funded from unjust income, can be considered unjust. Also crucial is whether saving from unjust income is used to accumulate human as well as physical capital. The relative levels of saving out of labour and capital can have a very significant effect on the half-life of injustice—that is, the period until the unjustly acquired assets have fallen to half their initial level.

In assessing the issue of how injustice fades—or does not—I use neoclassical growth models where there is a unique steady state to which the economy converges. But it turns out that this does not mean that half-lives of injustice—the period until the proportion of income or wealth that is unjust falls to half its value at some initial start point—need be low, or even finite.

The key elements of the economic mechanisms behind the calculations on the half-life of injustice are these: that output depends on labour input and capital that is accumulated out of investment that comes from saving; capital grows when investment exceeds the depreciation of the existing stock of capital and incomes from production are shared out between providers of labour and capital. I distinguish between a part of accumulated capital that was either directly acquired unjustly (or comes from saving out of income that itself derives from assets originally acquired unjustly) and the rest. We keep track of the stock of unjustly acquired assets by noting how it falls with depreciation over time but is added to by new investment from saving out of income that itself is derived from the stock of unjust assets. In this way, the evolution of the stock of unjust assets reflects how great were unfairly acquired resources at some point in the past, how fast they depreciate, how much income is derived from such assets and what fraction of such income was used to finance new investment. It is this final factor which perpetuates the injustice in the incomes that comes from unjust initial acquisition of assets at some point in the past.

https://doi.org/10.1017/nie.2020.50 Published online by Cambridge University Press

The details of the model are briefly outlined in the Appendix; much more detail is provided in Miles (2018).

2. Some illustrative calculations on half-lives

The tables below show results from various thought experiments. Each table shows how injustice evolves from a start point in the past where a high proportion of productive assets (machines, commercial buildings, houses, agricultural land and so on) had been acquired unjustly. The proportion of total income (GDP) that is a result of using such unjustly acquired assets is shown as well as the proportion of all assets (wealth) that is unjust. The assumption here is that injustice in latter periods simply reflects the impact of past injustice due to long-lived assets and to new capital accumulation from saving out of unjust income. I assume total output is produced by a constant elasticity of substitution (CES) production function using capital (either physical capital alone or including human capital as well) and labour. I start by considering physical capital—or tangible wealth—and add human capital in a later section. The labour share parameter is set at 0.7. I illustrate by assuming 70 per cent of total initial capital has been unjustly acquired. But what is important in the tables is not so much whether initial unjustly acquired capital is 70 per cent or some much lower figure, but how quickly injustice in wealth and income changes. The half-life is essentially invariant to the assumed initial level of injustice in asset ownership.

Table 1 shows a simple case—assets are expropriated from some overseas country and brought back to the home country to be used with domestic labour. That boosts the incomes of owners of those assets but also boosts domestic labour incomes and all such extra income is counted as 'unjust'. But it fades over time depending on savings rates and depreciation. Making assumptions on overall saving rates (calibrated to generate plausible rates of return on assets based on historical data) and on deprecation rates generates half-lives which tend to be quite low—rarely much more than 30 years. The half-lives are shown in the bottom row of the table (details of the calibration of the model are in the Appendix).

Table 1 shows that the effects of expropriating assets on a large scale from a foreign country tend to die out within 70 years or so. The half-life of injustice—the period by when the effect of the stolen assets on income and on wealth is only half of its initial size—is around 20 years (for incomes) and no more than 30 years for wealth.

Is this result plausible? Some will feel it is not and that high levels of material well-being in Europe today must depend greatly on the imperial past of most European countries. But that claim itself is not particularly convincing. Germany has a very high standard of living today. Its imperial assets had all gone by the end of the Second World War, and many of its domestic assets were devastated by the war. Belgium looted vast wealth from the Congo at the start of the nineteenth century—but much of those

Table 1. Assumes a common saving rate out of capital and labour income to deliver a rate of return, *r*, of 5 per cent; growth of labour force = 0.005; productivity growth = 0.015; half-life is the number of years to reduce injustice to half its initial value

	Depreciation rate 3 per cent		Depreciation rate 2 per cent	
Time	**Share unjust assets**	**Share unjust income**	**Share unjust assets**	**Share unjust income**
$t = 0$	0.70	0.30	0.7	0.30
$t = 20$	0.39	0.14	0.44	0.16
$t = 50$	0.14	0.05	0.20	0.07
$t = 75$	0.06	0.02	0.10	0.03
$t = 125$	0.01	0.003	0.03	0.008
Half-life in years	24	18	30	23

https://doi.org/10.1017/nie.2020.50 Published online by Cambridge University Press

resources went to King Leopold II's personal fortune rather than generating productive assets that increased Belgium GDP in ways that account for its high standard of living today. Many of the richest European countries—Sweden, Norway and Denmark—have not looted assets from other countries for centuries.

The longevity of the effects of unjust acquisition of assets can be different when those assets are not looted from another country but instead come from reallocation (i.e., theft) of assets from one group by another within the same country (or economy). It is plausible that historically much unjust acquisition came about this way. The key difference here is that the aggregate stock of productive assets (wealth) is not altered as a result of this kind of injustice. The flow of capital income does go to different people—less to the expropriated and more to the expropriators. But wage income may be hardly affected at all. With a standard aggregate production function for the whole economy, wages depend on the aggregate ratio of capital to labour. Since neither change when some capital is (illegitimately) transferred from one resident to another, then wage income may be unchanged. This is different from the case of unjust acquisition of assets from abroad—which boosts both capital and labour incomes for the domestic population of the country which acquires the foreign assets.

A key difference in this case is that the evolution of economic injustice (flows of income and stocks of assets that can be judged to have come about illegitimately) depends positively on saving out of capital incomes but not on saving our of labour income. This is because labour income is not boosted by the unjust transfer of productive assets within a country. Some part of capital income becomes unjust after domestic theft of assets; that is not true for labour incomes. My wages from working in a factory do not become illegitimate because the current owner defrauded the previous owner of ownership rights to the profits it creates.

What this means is that if saving out of labour income is high while that out of capital income is low, then initial injustice in overall incomes from domestic expropriation of productive assets can quickly become low. But the converse is true: if nearly all investment comes from saving out of capital incomes, and very little from saving out of labour incomes, the injustice from some expropriation of domestic assets by one group can last a long time. Table 2 illustrates the scale of the effects. We focus here on a case that has been more relevant for much of history—this is one where most investment is financed from saving out of capital incomes and relatively little from saving out of labour income. Up until the start of the twentieth century, relatively little national savings came from workers accumulating assets. This changed a great deal in the twentieth century.

There is a surprising result from this standard neoclassical growth model and the Nozick principles of how unjust acquisitions evolve—if the saving rate out of labour income approaches zero injustice never fades at all. But provided there is a nontrivial amount of saving out of labour income, unjust capital will dwindle a great deal in a few generations.

Table 2. The weighted average saving rate is so as to deliver $r = 5$ per cent; Cobb Douglas production

	Saving rate from capital income		Saving rate from capital income	
	5 times saving rate from labour income		10 times saving rate from labour income	
Time	Share unjust assets	Share unjust income	Share unjust assets	Share unjust income
$t = 0$	0.7	0.21	0.7	0.21
$t = 20$	0.52	0.16	0.58	0.17
$t = 50$	0.33	0.10	0.43	0.13
$t = 75$	0.23	0.07	0.34	0.10
$t = 125$	0.10	0.03	0.21	0.06
Half-life in years	46	46	76	76

https://doi.org/10.1017/nie.2020.50 Published online by Cambridge University Press

In modern developed economies, saving out of labour incomes—some of it in the form of pension contributions and much of it in the form of paying off mortgages—has become significant. Savings out of labour income in the more distant past were very low. Table 2 shows half-lives of injustice were then plausibly much longer when assets were looted domestically than when they came from abroad. But those half-lives are likely to be lower today when savings out of labour incomes are substantial.

3. Human capital

In the past, saving out of labour income may have been low, but the contribution of human capital (acquired skills due to education and training) was probably also less important than it has subsequently become. And the rise of the importance of human capital has significance for the propagation of economic injustice. Some part of human capital is likely to be financed out of income that itself comes from ownership of assets that have been acquired (maybe in the distant past) unfairly. The children of the aristocracy and of the robber barons of the past (and of today's oligarchs) typically have had an unusually good—or at least expensive—education.

We now allow for human capital and for the fact that some of it may reflect investment funded from resources acquired unjustly. Human capital is clearly now a major factor in determining incomes—far more than in preindustrial and largely agrarian societies and probably more than in the early part of the twentieth century when manual labour remained the dominant form of work in many industrial economies. It is very clear that much acquisition of human capital does indeed require investment of resources—in computers, books, school building, training facilities and also the wages of teachers. Some part of labour income can plausibly be considered unjust if it reflects past investment in human capital that was financed out of resources that were themselves acquired illegitimately.

We now account for the effect of some parts of human capital having been financed out of unjustly acquired resources. We find that if the share of total labour remuneration that reflects human capital is high, the half-life of injustice can become very long. Using similar assumptions on asset lives as in table 1 with a deprecation rate of 3 per cent on physical capital and 2 per cent on human capital—and assuming approximately equal saving rates out of all income into investment in physical and human capital—the half-life of injustice can rise to around 50 years. Table 3 illustrates using a value of human capital such that it accounts for one half of total labour remuneration. Comparing tables 1 and 3 shows that the period over which injustice lasts is roughly twice as great when the way in which human capital is accumulated itself reflects past injustice in how wealth and income came to be owned.

The half-life of injustice can rise to 100 years and beyond once human capital accounts for 75 per cent or more of total labour income. In fact, one can show a rather remarkable result, which is that as the share

Table 3. Saving rates deliver $r = 5$ per cent on both physical and human capital; depreciation rate is set at 0.03 for physical capital and at 0.02 for human capital. The saving rate for human capital is set at 0.2 and for physical capital is 0.1875. The implied share of human capital remuneration in overall remuneration of labour is 0.5

Time	Share of unjust physical capital	Share of unjust human capital	Share of unjust income
$t = 0$	0.70	0.70	0.46
$t = 20$	0.51	0.54	0.34
$t = 50$	0.31	0.34	0.22
$t = 75$	0.21	0.24	0.15
$t = 125$	0.10	0.11	0.07
Half-life in years	44	49	47

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of labour remuneration that reflects human capital (rather than innate labour power) rises towards 100 per cent the effect of injustice in past acquisition of assets may never fade at all.

3.1. Are half-lives rising or falling?

Is the rate at which injustice stemming from unfair acquisition of assets fades higher or lower now than in the past? Human capital has become more important in modern economies and saving out of labour income is also higher than in the distant past. These two factors pull in different directions meaning it is not obvious whether the half-life of injustice is higher or lower than in the past. But it is likely that for much of the period up to the early twentieth century saving out of labour income for the great majority of the population was very low—probably negligible. If that saving rate out of labour income was negligible, the half-life of injustice would have been very long. Such saving is now not negligible. The fraction of labour remuneration due to human capital would have to rise to nearly 1 to offset the effect of that so as to keep the half-life of injustice from falling. While human capital now very likely does account for a much higher share of labour income than 100 and more years ago, its share has not approached 100 per cent, so on balance it seems likely that the half-life of injustice is now lower in developed economies than in the world of 100 or more years ago.

4. An overview of the model and its assumptions

The calculations I have presented throw some light on the contentious issue of how much today's incomes and wealth reflect economic injustices from the past. I focus on one aspect of injustice—the idea that if you can draw a direct causal link showing that some part of income and wealth today depends upon assets unjustly acquired in the past, then that income and wealth is itself unjust. There may be many other aspects of economic injustice—some would say that resources you come to own through luck are not fairly owned (or at least not as fairly your own as are resources you worked for and saved to acquire). More fundamentally, some—including John Rawls—argue that no matter how an unequal distribution of resources arises, if that creates worse outcomes for the least well off, it is unjust. One does not need to reject these ideas to still see value in the calculations presented here. One aspect of injustice surely makes relevant the way in which resources came to be distributed, and that is the idea at the heart of the modelling in this paper. The key idea is that all future incomes and wealth that come about as a result of unjustly acquired assets are unjust—this is why savings rates out of past unjust incomes and the depreciation of unjustly acquired assets are key.

The calculations I have reported seem particularly relevant to the issue of reparations for past economic crimes. They speak directly to the issue if we accept one principle. This is that the amount due in reparations from people today as a result of injustice committed not by them but by their ancestors exists only to the extent that they are better off as a result of such past injustices. That is what the half-life calculations illuminate. Some would argue that descendants of those who committed past economic crimes should make amends even if they themselves have not benefitted. This seems counter to powerful moral convictions—in particular, that one should not be held responsible for crimes committed by someone else (even if they are your great grandfather). But the half-life calculations do accord with a widely held moral belief, which is that I should not benefit from crimes, whether I committed them myself or not.

One caveat is in order. This is that I have relied on neoclassical growth models (though I have allowed for differential saving rates out of different sorts of incomes and for differences between physical and human capital). I have assumed factors of production are paid their marginal product. Perhaps more important, I have focused on the resources that exist in countries where expropriated assets exist and not on countries which may have seen assets looted from them. It is possible that today's populations of former imperial powers benefit very little from those past empires, and yet countries that were colonised

https://doi.org/10.1017/nie.2020.50 Published online by Cambridge University Press

by them might pay a more long-lasting price for past injustices. But, as argued above, the case that this justifies reparations from the descendants of past colonisers does not immediately follow from that.

5. Conclusions

I have adopted the principle that it is how assets came to be acquired historically that determines whether their ownership today is just or unjust. Using standard models of growth and commonly used assumptions on saving rates, depreciation rates and production technology would then imply that the period over which injustice fades to half its initial value is generally less than 50 years. This would mean that the economic impact of an unjust acquisition of assets in 1820 would now probably be no more than one-sixteenth of what it originally was. That there were great injustices in how assets were distributed 200 years ago is very clear. That this accounts for a substantial part of the way in which incomes and wealth are distributed today is far less plausible. If it is right that only a very small part of incomes and wealth now are a result of ownership of assets that were acquired in manifestly unjust ways from more than 150 years ago, then the case for substantial reparations is much weakened. If it is right that relatively small amounts of wealth now exist because of such historical injustices, then there are few people from whom reparations are clearly due.

A strong case can be made that it only those who themselves have benefitted from past injustices can be held responsible for making reparations. To assert there is an obligation on current people to pay reparations because of a general responsibility for actions by their ancestors—even though they have not benefitted in any way from them—seems counter to the principle that it is unfair to make people guilty for their father's sins. The principle behind the analysis in this paper is that guilt (more precisely, economic responsibility) is transferred only to the extent that the sins of previous generations bestow economic advantage on the people of today. It concludes that the scale of such responsibility is likely to be limited when historic injustice took place before the twentieth century.

This conclusion does depend on particular assumptions about how incomes are generated, and there are production technologies which would generate much more long-lasting effects of past economic injustice. If human capital (i.e., acquired skills from applying resources to education and training) accounts for nearly all of labour incomes, then injustice can last much longer. If saving rates out of labour income are zero, injustice in ownership of wealth can also be very long-lasting. But neither assumption is particularly plausible.

The conclusion I reach on the scale of economic injustice also depends on the idea that there is nothing intrinsically unjust in the distribution of income and wealth that comes about as a direct result of some people today having inherited assets that were legitimately owned by their ancestors who chose to bequeath them. Some view inherited wealth as inherently unfair and will dismiss the results reported here as missing much of what is unjust in the current distribution of wealth and income. But that view is in conflict with a deeply held desire of people to want to help their children. It also leads to the strange conclusion that while it is legitimate for someone to use their wealth and income to increase their own consumption, a decision to cut back on their own spending to ensure a future generation has more resources is unjust and should be thwarted by punitive tax. The idea that the optimal tax on own consumption should be lower than the tax on assets given to someone else (no matter what the resources of the recipient) is not appealing; the idea that the optimal tax on such bequests should be less than 100 per cent only because of some efficiency losses seems completely at odds with the notion of justice held by the vast majority of people.

Acknowledgement. This article is based on the annual Anglo German lecture delivered in Berlin in June 2019.

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https://doi.org/10.1017/nie.2020.50 Published online by Cambridge University Press

A. Appendix. The growth model

This appendix draws heavily upon Miles (2018).

Here I present brief details of the model used to assess how long unjustly acquired assets influence wealth and income into the future.

Assume output is produced with a CES production function which combines labour and capital. Markets for capital and labour are competitive, and factors paid their marginal product. Aggregation from production at the level of individual enterprises is possible, and I focus on total output produced from aggregate capital and labour. Capital is accumulated when gross investment (which equals saving in a closed economy) exceeds depreciation. To keep the capital to effective labour ratio constant, net investment must also match the growth in the labour force plus productivity growth. The saving rates out of capital income (s_π) and out of labour income (s_L) are assumed constant. Output (GDP) at time t is denoted Y_t and is given by

$$Y_t = \left[\alpha K_t^\beta + (1-\alpha)L_t^\beta\right]^{1/\beta}, \tag{A1}$$

where $1/(1-\beta)$ is the elasticity of substitution between capital (K) and effective units of labour (L); α is a share parameter.

The aggregate effective labour force evolves according to

$$L_t = L_{t-1}(1+n+g), \tag{A2}$$

where n is the growth of population (and labour force) and g is the growth of labour productivity. The share of returns to capital in total output (π) is

$$\pi_t = \alpha(K_t/Y_t)^\beta. \tag{A3}$$

The share of labour income is $(1-\pi)$.

Capital evolves according to

$$K_t = K_{t-1}(1-\delta) + s_\pi \pi_t Y_{t-1} + s_L(1-\pi_t)Y_{t-1}, \tag{A4}$$

where δ is the depreciation rate of capital. The interest rate in the economy (r_t) is the return to capital net of depreciation, which is

$$r_t = \alpha(Y_t/K_t)^{1-\beta} - \delta. \tag{A5}$$

Assume that at some initial time $t=0$, the capital stock is made up of a stock of capital which has been unjustly acquired, K_0^U, and a stock of capital which has been justly acquired, K_0^J,

$$K_0 = K_0^U + K_0^J. \tag{A6}$$

Let the proportion of capital which has been unjustly acquired be λ_0, so that

$$K_0^U = \lambda_0 K_0. \tag{A7}$$

The ratio of unjust capital to total capital at time t is λ_t.

The evolution of the stock of just and unjust capital, and the fraction of income that is unjust, depends on how we view income and saving generated as a result of the original stock.

If assets are expropriated from foreigners, then all the income derived from those assets—the direct return on that capital and the extra labour income generated by that capital—is unjust. In this case, it is straightforward to compare how capital and income evolve with and without the unjust capital. Initial unjust capital is $\lambda_0 K_0$. Initial just income is

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$$Y_0^J = \left[\alpha((1-\lambda_0)K_0)^{\beta} + (1-\alpha)L_0^{\beta}\right]^{1/\beta}. \tag{A8}$$

Just capital evolves according to

$$K_t^J = K_{t-1}^J(1-\delta) + s_\pi \pi_t Y_{t-1}^J + s_L(1-\pi_t)Y_{t-1}^J, \tag{A9}$$

whereas unjust income is defined as

$$Y_t^U = Y_t - Y_t^J. \tag{A10}$$

Unjust capital is simply

$$K_t^U = K_t - K_t^J. \tag{A11}$$

If we start in a steady state, then K_t and Y_t grow at rate $(n+g)$.

In calculating fair income in period t, we are finding the level of output if the productive capital stock was just the fair capital of $(1-\lambda_t)K_t$. If $\beta = 0$, fair labour income is $(1-\pi)(1-\lambda_t)^{\alpha}Y_t$, and fair capital income is $\pi(1-\lambda_t)^{\alpha}Y_t$. The expressions are similar for the CES when $\beta \neq 0$, though capital and labour shares will vary over time until we reach a steady state.

The evolution of just output and just capital is exactly as it would be if the unjust capital was all repatriated at time 0. We can compare income and capital with and without repatriation, and those ratios tell us how much of today's capital and income is just—given no historic repatriation.

For $\beta = 0$ (the Cobb Douglas case), there is a closed form expression for the ratio of just to unjust capital at time t. If the initial ratio of total capital at time 0 to steady-state capital at that time is denoted χ, then the ratio of unjust capital to total steady-state capital at time 0 is $\lambda_0\chi$. For $\beta = 0$, this means that at time t, the ratio of just to total capital (in a continuous time version of the model) is then given by

$$K_t^J/K_t = \left\{\left[\left(((1-\lambda_0)\chi)^{1-\alpha} - 1\right)e^{-(1-\alpha)(n+g+\delta)t} + 1\right] / \left[\left(\chi^{1-\alpha} - 1\right)e^{-(1-\alpha)(n+g+\delta)t} + 1\right]\right\}^{1/(1-\alpha)}, \tag{A12}$$

and unjust income to total income at time t is

$$Y_t^J/Y_t = \left(K_t^J/K_t\right)^{\alpha}. \tag{A13}$$

The results in the text are for this Cobb Douglas case.

In the case of assets expropriated from foreigners and then used in the expropriator's economy (but not in general), the ratio of unjust income to total income depends only on the overall saving rate and not on the relative magnitude of saving out of capital and income. This is no longer true if we treat labour income that depends on past acquisition of unjust capital as itself fair—a case we consider in the main paper when we look at capital acquired unjustly from others in the same economy.

When we consider human capital, we assume effective labour input reflects labour hours and the acquired stock of human education, training and knowledge. This human capital stock evolves as a result of the net impact of investment in education and training, and depreciation of past skills.

A.1. Calibration of parameters for illustrative estimates of half-lives of injustice

n : We set population growth at 0.5 per cent a year in the base case and also show the impact of faster growth.

g : I take labour productivity growth of 1.5 per cent and also show the impact of higher and lower growth.

α : I set α (the share parameter in the production function) to the typical share of capital in private domestic value added in developed economies in recent years. This figure is around 0.3.

https://doi.org/10.1017/nie.2020.50 Published online by Cambridge University Press

Using these figures for α, n, g, δ, we can assess what rate of saving s is needed to generate a rate of return, r, which is plausible, given the historical evidence. A figure of 5–6 per cent seems reasonable for the past weighted average of returns on all real assets. I use a figure of 5 per cent.

If the net return is 0.05 and $\delta = 0.03$, we require a saving rate to satisfy: $0.05 + 0.03 = \alpha(K/Y)^{\beta-1} = \alpha(s/(n+g+\delta))^{\beta-1}$ For $\beta = 0$, this implies $s = 0.1875$ and steady state K/Y is 3.75. That saving rate has been a little below the OECD countries' average gross capital formation rate relative to GDP since 1960 and also a little below that ratio for the United States (both average close to 22 per cent over the period 1960–2017).

Cite this article: Miles, D. (2021), 'How long does economic injustice last?', *National Institute Economic Review*, **255**, pp. 69–78. https://doi.org/10.1017/nie.2020.50