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Article

Schooling, nation building and industrialization

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Abstract

We consider a Gellnerian model to study the transformation of a two-region state into a nation state. Industrialization requires the elites to finance schooling. The implementation of statewide education generates a common national identity, which enables cross-regional production, while regional education does not. We show that statewide education is chosen when cross-regional production opportunities and productivity are high, especially when the same elite holds power at both geographical levels. By contrast, a dominant regional elite might prefer regional schooling, even at the loss of large cross-regional production opportunities if it is statewide dominated. The model is consistent with evidence for five European countries in 1860–1920.

Keywords

Education; industrialization; nation building

1. Introduction

How does a state turn into a nation state? According to Gellner (1964, 2006), the transition results from the implementation of a mass education system to get workers ready for industrialization. Because workers, through schooling, acquire a common national identity that enables them to communicate with each other, they also become mobile, which enhances the production potential of the economy.

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Historically, however, not every state becomes a nation state, as nation building at the state level can fail and give rise to stateless or peripheral nations, such as Quebec, Scotland, Catalonia or Flanders (see, e.g., Keating, 1993, or Laitin, 1989).

To understand nation building success or failure, our paper presents a Gellnerian model in which the transformation of a state into a nation state, or instead the emergence of a peripheral nation, is modelled as an equilibrium outcome stemming from the interaction among elites in the decision to set up a schooling system.

To this purpose, we model a state composed of two regions characterized by an initial degree of heterogeneity[1] or imperfect market integration. The state is populated by masses and by two elite groups (landowners and bourgeoisie), with both masses and landowners evenly split across regions, but bourgeois over-represented in one region. Political power is in the hands of one of the elite groups, referred to as the 'dominant group', which is not necessarily the same at the regional and state levels. Value is created through bilateral production between the members of the elites and the members of the masses. Initially, the state is pre-industrial and production takes place only within each region.

The economy is hit by a productivity shock representing an industrialization opportunity, which can only be exploited if the elites decide to finance the set-up of a schooling system. If this is the case, the masses attending school become more productive, and particularly so in the matches with the bourgeois.[2]

In addition to raising productivity, schools generate a national identity.[3] If the statewide dominant elite implements schooling in both regions (a 'unified schooling' system), this creates a common identity to both regions, which enables the bourgeois to produce with the masses of the other region, and this to an extent determined by the degree of market integration. Alternatively, if a regionally dominant elite implements schooling for a region alone without sharing the associated costs and benefits with the wider state-level elites, no common cross-regional identity is created, cross-regional production remains infeasible and a peripheral nation arises. In both cases, the dominant group decides on how the school set-up cost is shared with the dominated elite at the relevant geographical level – but the dominant group cannot force the dominated to make payments that leave them worse off than under no education.

We first characterize equilibrium education levels and show that education is implemented for sufficiently large industrialization shocks, with a larger share of the investment being paid by the dominated group as the industrialization opportunity becomes better. The identity of the dominant group does also matter, and equilibrium education is shown to be higher when bourgeois dominate, since they benefit more from industrialization than landowners. Specifically, for relatively low industrialization shocks, dominant bourgeois might choose to fully finance education even if this makes the dominated landowners worse off, while instead in a similar situation dominant landowners are not willing to implement education.

As for the choice of the schooling system, unified schooling is always (weakly) preferred at equilibrium whenever the dominant group is the same at the regional and state levels, and market integration and/or productivity are sufficiently high.

This result stems from the technological advantage given to unified schooling. Specifically, a dominant bourgeoisie prefers this system because it can directly benefit from a large number of cross-regional matches, while dominant landowners also favour it because the bourgeois are willing to pay a larger share of the schooling cost under this system.

However, if both market integration and the industrialization shock are low, the gains from cross-regional production stemming from the unified system become much smaller, and then the dominant bourgeois from the bourgeois-abundant region prefer regional schooling because the greater number of bourgeois in that region reduces the per-capita set-up cost of education. Similarly, if dominant, the landowners from that region will choose regional schooling, this time because bourgeois are more willing to implement education in that region or more willing to pay than under unified schooling.

In addition, we show that regionally and statewide dominant elites never choose to implement regional schooling in the bourgeois-scarce region, as this would entail the double disadvantage of a loss of (however small) cross-regional production and a greater per-capita set-up cost of education.

When the regionally dominant elite does not control power at the state level, its incentives to choose regional schooling become greater, simply because more costs can be transferred to the other elite at that level. Specifically, regionally dominant but statewide dominated landowners always support regional schooling when feasible. For them, indeed, being dominated under a unified system is particularly dangerous as the large gains that bourgeois might enjoy under that system can result in the bourgeois fully financing schooling and making them worse off than under no schooling.

Regionally dominant but statewide dominated bourgeois will still choose unified schooling when the cross-regional production gains are large, i.e., when both the industrialization shock and market integration are large, as in that case it is still profitable to get a smaller share of a much bigger cake. At the same time, bourgeois-led regional schooling can still arise in situations in which cross-regional production gains are very large and market integration is perfect: indeed, if the productivity gain from the masses' education is much smaller for landowners, statewide dominant landowners will choose not to implement unified schooling even if the bourgeois are willing to fully pay for it, leaving regional education as the best (and only) option for the bourgeois.

We also show that the regionally dominant but countrywide dominated bourgeois of the bourgeois-scarce region may have an incentive to implement regional education, as the greater per-capita costs can be compensated for by a larger part of the total cost being transferred to landowners. This equilibrium outcome can be related to Gellner's famous example of the creation of a national identity in backward Ruritania (Gellner, 2006).

Finally, we relate our model to the educational choices for 1860–1920 of five European countries characterized by different power configurations within the elites and different nation building outcomes. To this purpose, we first draw on the history literature[4] to determine for each of these countries the identity of the

dominant group or groups, the characteristics of their educational choices and their main nation building outcomes. Next, using historical data for these countries on the size of their railway networks (Martí-Henneberg, 2013) and their gross domestic product (GDP) per capita (Maddison, 2003) as proxies for, respectively, market integration and the industrialization shock, we show that the observed educational choices are compatible with the model along different dimensions. In particular, a lack of implementation of education occurs for a small railway network and a low GDP per capita, while, conversely, large networks and high GDP per capita are associated with the choice of unified schooling.

Our paper contributes to the existing literature in two ways. First, we propose (to the best of our knowledge) the first modelling of a nation building process à la Gellner,[5] and do so by explicitly incorporating the role of elites following Breuilly's critique (Breuilly, 1993) of Gellner's theory and other nation building theories underlining the importance of the interaction between central and peripheral elites (see, in particular, Kroneberg and Wimmer, 2012, and Roeder, 2007). Second, we provide a theoretical framework for understanding the endogenous emergence of peripheral vs. statewide nations and link it to the existing historical evidence for five European countries characterized by different power configurations.

The remainder of the paper is organized as follows. In Section 2, we develop the basic model and describe when unified schooling and regional schooling are implementable. In turn, in Section 3 we analyse the choice of education system by the elites; finally, in Section 4, we relate our model to the historical evidence for five European countries. Section 5 concludes the paper. Most proofs are relegated to an appendix.

2. The model

Consider a pre-industrial state with two regions $i = 1, 2$. In each region, there are three social groups, namely the masses $M = M_1 + M_2$ and the elite, which is split into the landowners $N = N_1 + N_2$ and the bourgeoisie $B = B_1 + B_2$ (with $M > N + B$). Political power is, for historical reasons, in the hands of one elite group at the statewide level, but a different elite might be dominant in one of the regions. We normalize the total size of the elite in the state to $N + B = 1$. For simplicity, we assume that both landowners and masses are equally distributed across regions, i.e., $N_1 = N_2 = N/2$ and $M_1 = M_2 = M/2$. Instead, one region is characterized by a larger bourgeoisie than the other, and this region is assumed to be region 1, without loss of generality (i.e., $B_1 > B_2$).

Value is created through bilateral production between members of the elites and members of the masses. Initially, production takes place only within each region and the surplus from each match is normalized to 1. The bargaining power of the masses is given by β, which simply implies in our framework that a member of the elites who is matched to a member of the masses keeps $1 - \beta$ of the surplus generated from the match.

There are two periods in our model, with production taking place in each of them. Let Ψ_j $(j = B, N)$ denote the payoff of a member of elite j. Initially, any

member of the elite produces an output of 1 with each of the $M/2$ members of the masses living in his region in each of the two periods, and gets a proportion $1-\beta$ of the output. As a result, the payoff of a landowner is the same as that of a bourgeois and is given by

$$\Psi_N = \Psi_B = (1-\beta)M \tag{1}$$

2.1. Schooling

This rural society is now hit by a productivity shock representing an industrial revolution. If the new technology is implemented, the match productivity in the agrarian sector (landowner-masses) increases to $1+\sigma$, while the match productivity in the industrial sector representing a match between a bourgeois and the masses increases to $1+\mu\sigma$ where $\mu>1$. However, the increase in productivity only occurs if the elites finance the setting up of schools. Otherwise, the productivity of the match remains equal to 1. Schooling also generates a national identity among the students.

The set-up of the schooling system requires a total investment by the elites equal to the number of students attending school. In the first period, the productivity shock is observed and the schooling decision is made. If schooling is implemented, production takes place only in the second period. If schooling is not implemented, production takes place in both periods but the match productivity stays equal to one.

Two possible ways of organizing the schooling system can be chosen by the dominant elites. Specifically, the dominant elite at the state level may promote the implementation of schooling in both regions ('unified education', denoted by U), which generates a common national identity in the two regions and, for this reason, the possibility of inter-regional production matches for the bourgeoisie. The extent to which inter-regional production is possible depends on the existing level of integration of the regions. After the implementation of unified schooling, the state becomes a nation state. Alternatively, a dominant regional elite may promote the implementation of schooling in that region alone and organize its funding at the regional level (referred to as region-i schooling, and denoted by R_i), which transforms the region into a peripheral nation.[6]

We denote by Π_j^k the payoffs from schooling for elite $j=B,N$ under organizational system $k=U,R_i$. Similarly, I_e^k denotes the cost of setting up schooling system k for an individual belonging to elite group $e=N,B$. We next present the benefits from schooling for the elites under the two different systems.

2.1.1. Unified schooling. Under the unified system, any bourgeois pays I_B^U schooling set-up costs and appropriates a fraction $1-\beta$ of the amount $1+\mu\sigma$ produced in period 2 with mass members from his own region and with a fraction α of the masses from the other region. The parameter α captures the market integration level of the two regions, with $0 \leq \alpha \leq 1$. Mathematically, the payoff for the bourgeois is thus

$$\Pi_B^U = -I_B^U + (1-\beta)(1+\mu\sigma)\frac{M}{2}(1+\alpha) \tag{2}$$

The landowner's payoff depends on his own investment I_N^U and is associated with a lower match productivity $(1+\sigma)$ and with a smaller pool of mass members than for the bourgeois, namely the $M/2$ mass members living in the landowner's region

$$\Pi_N^U = -I_N^U + (1-\beta)(1+\sigma)\frac{M}{2} \tag{3}$$

2.1.2. Region-i schooling. The region-*i* dominant elite might have incentives to finance schooling in its own region without the elites from the other region paying or benefitting from education. As no common identity is created across regions, cross-regional production cannot take place.

The region-*i* bourgeoisie's payoff is, in that case

$$\Pi_{B_i}^{R_i} = -I_{B_i}^{R_i} + (1-\beta)(1+\mu\sigma)\frac{M}{2} \tag{4}$$

i.e., each region-*i* bourgeois invests $I_{B_i}^{R_i}$ in the set-up of schools in his region and gets the proceeds from the future high productivity matches with region-*i* masses. Similarly, the payoff from region-*i* education for region-*i* landowners is

$$\Pi_{N_i}^{R_i} = -I_{N_i}^{R_i} + (1-\beta)(1+\sigma)\frac{M}{2} \tag{5}$$

2.2. Education thresholds of the elites

A member of elite e will be willing to make a payment I_e^k to finance education system k whenever his resulting payoff exceeds the no-schooling payoff, i.e., whenever

$$\Pi_e^k\left(I_e^k, \sigma\right) \Psi_e \qquad \text{for} \qquad e = B, N \text{ and } k = U, R_i$$

As, from equations (2) to (5), the payoff $\Pi_e^k(I_e^k, \sigma)$ is increasing in σ, there exists a productivity threshold such that paying for schooling is profitable if and only if σ is above that threshold. At the same time, the threshold positively depends on I_e^k, as a larger cost requires a higher productivity for the investment in education to be profitable.

Assume that the politically dominant elite can impose an education payment on the dominated elite as long as the dominated elite does not become worse off than under no education after making such a payment. If productivity is very high, dominated elite members might be better off than under no education even if they fully pay for education, i.e., even if each of them pays $\widehat{I}_e^k$. Specifically, from Figure 1, this happens whenever $\sigma > \widehat{\sigma}_e^k$ with $\widehat{\sigma}_e^k$ satisfying $\Pi_e^k(\widehat{I}_e^k, \widehat{\sigma}_e^k) = \Psi_e$. If such is the situation, the dominant elite chooses to extract $\widehat{I}_e^k$ from each of them and has an associated payoff $\Pi_{-e}^k(0, \sigma)$ characterized by no payment made for education. If instead $\sigma < \widehat{\sigma}_e^k$, the dominant group cannot get full payment from the dominated, but can

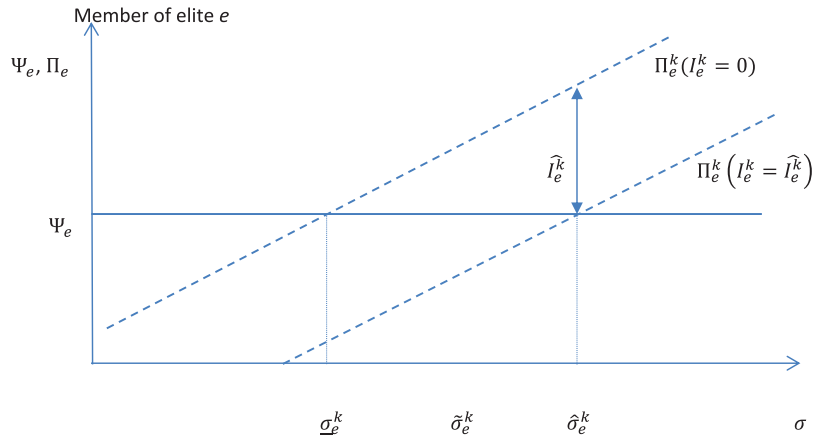

Figure 1. Threshold productivity levels for the elite.

still extract a payment $\overline{I_e^k}$ such that the dominated are indifferent between education and no education, i.e., such that $\Pi_e^k(\overline{I_e^k}, \sigma) = \Psi_e$. In that case, dominant elite members need to pay the remaining amount $\widetilde{I}_{-e}^k$ if they wish to implement education. Finally, it might be the case that the productivity is so low that the dominated group is unwilling to pay any amount for education, which happens if $\sigma < \underline{\sigma_e^k}$, where $\underline{\sigma_e^k}$ satisfies $\Pi_e^k(0, \underline{\sigma_e^k}) = \Psi_e$. In that case, the dominant elite can implement education only if it bears the full cost, i.e., its payoff is $\Pi_e^k(\widehat{I}_{-e}^k, \sigma)$.

Across elite groups, and for a given size of the cost, it is easy to show that the bourgeois choose to invest in education for lower productivity levels than the landowners, which simply comes from their greater interest in the masses' education. Note, however, that the relevant cost for an individual is the per-capita cost; thus, the size of the elite groups is a relevant variable too. Lemma 1 characterizes the ranking of the thresholds, while the full expressions for the thresholds and the payments are available in Table 1.

Lemma 1. *Let* $H^U = (1-\beta)B(\mu - 1 + \alpha(\mu + 1))$ *and* $H^{R_i} = 2(1-\beta)(\mu - 1)B_i$. *Then, for* $k = U, R_i$, *(i)* $\underline{\sigma}_B^k < \underline{\sigma}_N^k < \tilde{\sigma}_B^k = \tilde{\sigma}_N^k < \min\left[\widehat{\sigma}_B^k, \widehat{\sigma}_N^k\right]$ *if* $H^k < 2$ *and (ii)* $\underline{\sigma}_B^k < \widehat{\sigma}_B^k < \underline{\sigma}_N^k < \widehat{\sigma}_N^k$ *if* $H^k > 2$.

Proof. By simple algebra.

The attractiveness of schooling for the bourgeoisie relative to the landowners is particularly high when (i) μ is very high, i.e., the bourgeoisie has a big productivity advantage over landowners, (ii) the size of the bourgeoisie is large, as the per-capita burden from education for a bourgeois is then reduced, and (iii) for unified schooling, when market integration α is high, as only bourgeois have access to the masses in the other region. For this reason, when $H^k > 2$ is satisfied, the thresholds of the landowners are systematically larger than the thresholds of the bourgeoisie, and, in particular, $\widehat{\sigma}_B^k < \underline{\sigma}_N^k$ holds, i.e., there are situations (specifically, for $\widehat{\sigma}_B^k < \sigma < \underline{\sigma}_N^k$) in which the bourgeoisie is willing to set up schools bearing the full cost while

Table 1. Productivity thresholds.

	Unified education	Region-*i* education
$\underline{\sigma}_N^k$	1	1
$\underline{\sigma}_B^k$	$\frac{(1-\alpha)}{\mu(1+\alpha)}$	$\frac{1}{\mu}$
$\widehat{\sigma}_N^k$	$\frac{2+(1-\beta)N}{(1-\beta)N}$	$\frac{2+(1-\beta)N}{(1-\beta)N}$
$\widehat{\sigma}_B^k$	$\frac{2+(1-\beta)(1-\alpha)B}{(1-\beta)B\mu(1+\alpha)}$	$\frac{1+(1-\beta)B_i}{\mu(1-\beta)B_i}$
$\widetilde{\sigma}_e^k$	$\frac{2+(1-\beta)((1-\alpha)B+N)}{(1-\beta)(\mu(1+\alpha)B+N)}$	$\frac{2+(1-\beta)(2B_i+N)}{(1-\beta)(N+2\mu B_i)}$
$\overline{I}_N^k$	$\frac{(1-\beta)(\sigma-1)M}{2}$	$\frac{(1-\beta)(\sigma-1)M}{2}$
$\overline{I}_B^k$	$(1-\beta)(\mu\sigma(1+\alpha)-(1-\alpha))\frac{M}{2}$	$\frac{(1-\beta)(\mu\sigma-1)M}{2}$
$\widetilde{I}_N^k$	$\frac{2-(1-\beta)(\mu\sigma(1+\alpha)-(1-\alpha))B}{2N}M$	$\frac{1-B_i(1-\beta)(\mu\sigma-1)}{N}M$
$\widetilde{I}_B^k$	$\frac{2-N(1-\beta)(\sigma-1)}{2B}M$	$\frac{2-N(1-\beta)(\sigma-1)}{4B_i}M.$

schooling for free is still not beneficial to the landowners. Instead, for $H^k<2$, the attractiveness of education is more similar for both groups, and $\widehat{\sigma}_B^k>\underline{\sigma}_N^k$. In this case, the bourgeoisie's threshold for full education financing $\widehat{\sigma}_B^k$ might be bigger than the threshold for landowners $\widehat{\sigma}_N^k$, despite the extra gains from schooling for the bourgeoisie.

2.3. Equilibrium education

We are now in a position to study the decision on provision and financing of education by the elites for a given education system k.

2.3.1. Bourgeoisie dominant. Figure 2 represents, with a continuous line, the equilibrium outcome for the provision and financing of education when the bourgeoisie is dominant and $H^k<2$, i.e., when the profitability of education is not so different for the bourgeois and the landowners. The lines representing the payoff from education are steeper for bourgeois, given that $\mu>1$, while the distance between the two lines is bigger for the bourgeois if the size of the relevant bourgeois group is smaller (as in the example) than the size of the relevant group of landowners – i.e., $B<N$ in the case of unified schooling and $B_i<N_i$ in the case of regional schooling. For $\sigma>\widehat{\sigma}_N^k$, the landowners are willing to pay the full cost of education; thus, the bourgeoisie puts the full burden on them. For $\sigma_N^k=\widetilde{\sigma}_B^k<\sigma<\widehat{\sigma}_N^k$, the bourgeoisie can only impose part of the investment on the landowners, namely $\overline{I}_N^k\geqslant 0$, and has

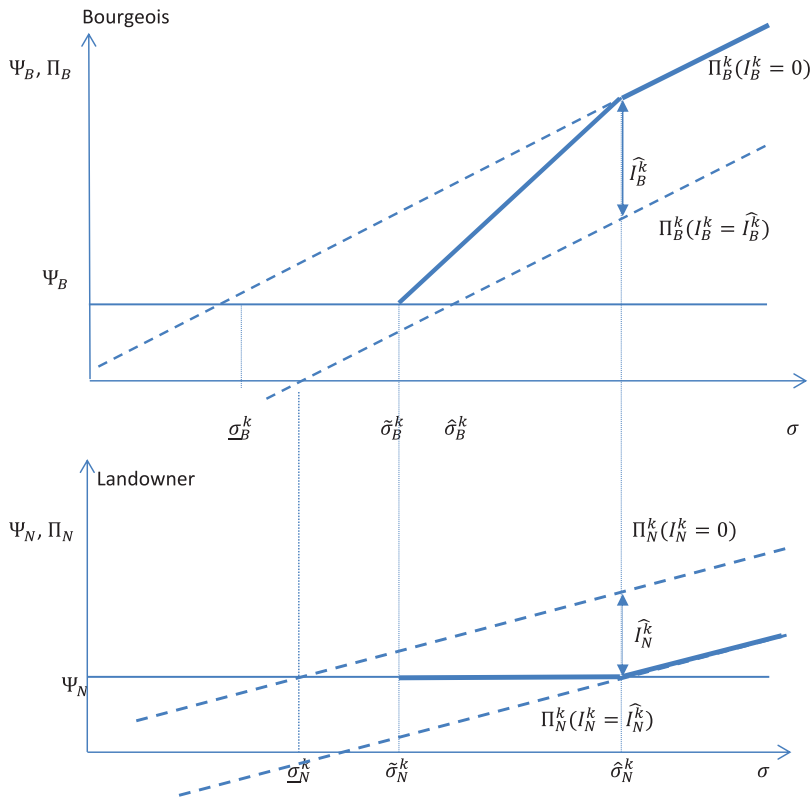

Figure 2. Bourgeoisie dominant and $H^k < 2$.

to finance the rest of the payment $\widetilde{I_B^k}$. Instead, for $\sigma < \widetilde{\sigma_N^k} = \widetilde{\sigma_B^k}$, education is not provided by the elites.

In turn, Figure 3 represents the outcome for $H^k > 2$, a situation in which the payoffs from education for the bourgeoisie relative to the landowners are particularly high. In this case, the elite is willing to provide education if and only if $\sigma > \widehat{\sigma}_B^k$. The main difference with the preceding case is that, for $\widehat{\sigma}_B^k < \sigma < \underline{\sigma}_N^k$, the bourgeoisie is willing to provide education even if it has to bear the full burden. In addition, in this area, the landowners become actually worse off after the implementation of education.

2.3.2. Landowners dominant. Figure 4 represents the case where the landowners are dominant and $H^k < 2$. In this case, the elite is willing to provide education if and only if $\sigma > \widetilde{\sigma}_N^k$. This provision is fully financed by the bourgeoisie if $\sigma \geq \underline{\widehat{\sigma}}_B^k$ and partially financed by each group otherwise, i.e., the payments are I_N^k and I_B^k for, respectively, landowners and bourgeois. For $H^k > 2$, instead, the bourgeois' incentives for education are particularly high, and this allows landowners to transfer the burden of education fully to the bourgeois (see Figure TA1 in the online appendix).

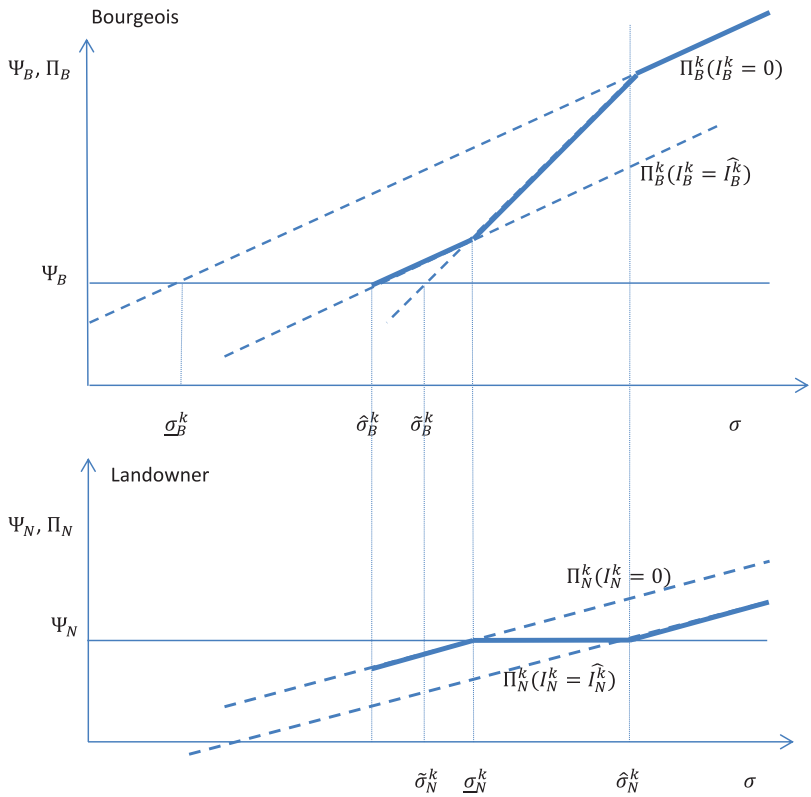

Figure 3. Bourgeoisie dominant and $H^k > 2$.

2.4. Landowners' vs. bourgeois' dominance

Proposition 1 compares the provision of education, depending on the identity of the dominant group.

Proposition 1. *For $H^k < 2$, schooling is implemented for $\sigma > \tilde{\sigma}_e^k$ independently of the identity of the dominant group. For $H^k > 2$, schooling is implemented earlier (specifically, for $\sigma > \widehat{\sigma}_B^k$) when the bourgeoisie is dominant than when landowners are dominant (implemented for $\sigma > \underline{\sigma_N^k} > \widehat{\sigma}_B^k$).*

Proof. Follows directly from the analysis in this section.

For $H^k < 2$, the threshold for the implementation of education is the same, no matter the dominant group. Intuitively, while dominant bourgeois have stronger direct incentives to implement education if their matches with the masses are very productive, dominant landowners react in the same way because a higher productivity of bourgeois-mass matches enables them to make the bourgeois pay a higher share of the cost of education.

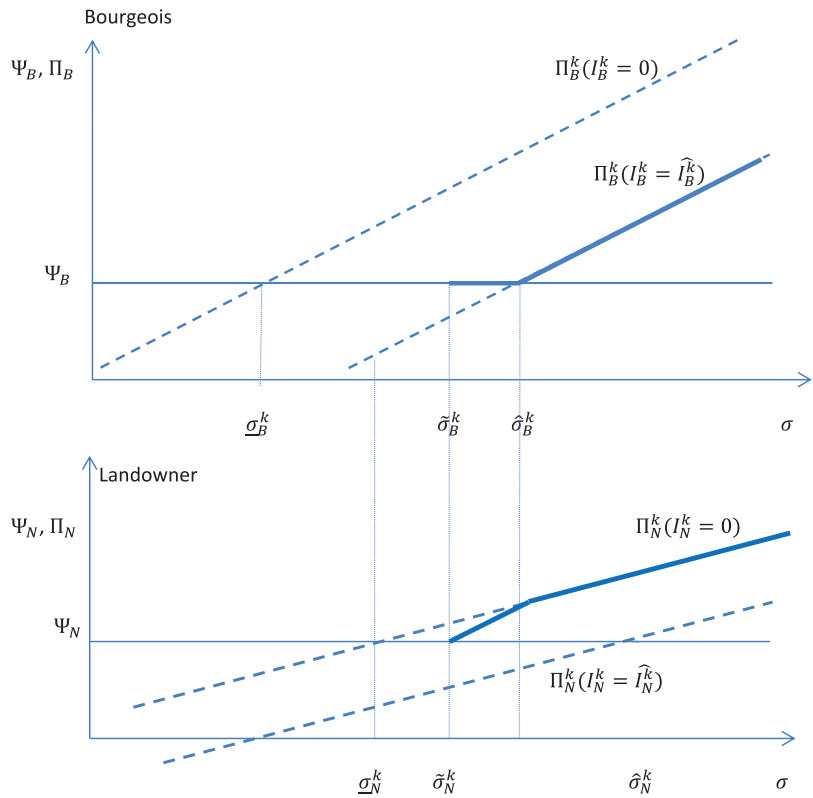

Figure 4. Landowners dominant and $H^k < 2$.

By contrast, for $H^k > 2$, the interests of the two elites are no longer aligned, and for $\underline{\sigma}_N^k > \sigma > \widehat{\sigma}_B^k$ education is only implemented if the bourgeoisie dominates. In this area, dominant bourgeois choose to finance education fully even if this makes the landowners worse off, while instead, in a similar situation, dominant landowners will not implement education as this would not be profitable for them even if the bourgeois were to finance education fully.[7]

The analysis so far has taken the potential educational system as given. However, the elites choose the education system depending on their political power and the resulting benefits.

3. The choice of education system

Each elite member prefers the education system that yields the highest benefits. Combining equations (3) and (5), we obtain that landowners prefer regional schooling to unified schooling whenever

$$\Pi_{N_i}^{R_i} \geqslant \Pi_N^U \Leftrightarrow I_{N_i}^{R_i} \leq I_N^U \tag{6}$$

i.e., landowners will simply go for the cheapest system in terms of their schooling set-up costs, because they do not benefit from the extra cross-regional matches generated under unified schooling. This implies in particular that if they are to finance education fully under both systems, they will be indifferent between the two schooling systems as region-i schooling halves the number of mass members to be educated but also the number of landowners financing education, i.e., $\widehat{I}^{R_i}_{N_i} = \frac{M/2}{N/2} = \widehat{I}^{U}_{N} = \frac{M}{N}$.

Instead, compared with unified schooling, regional schooling restricts the number of matches for the bourgeois, and especially so if market integration α is large, implying that region-i schooling will be preferred by the bourgeois only if it generates a sufficiently large educational cost reduction. Intuitively, this cost reduction will need to be larger the greater the bourgeois' productivity differential μ, as access to matches in the other region under unified schooling will be more valuable the larger μ. Note, however, that the relevant cost is the per-bourgeois cost: when going from unified schooling to region-i schooling, the number of bourgeois financing education falls from B to B_i. Intuitively, if B_i is sufficiently large, the fall in the per-bourgeois cost might be quite important and sufficient to compensate for the loss of cross-regional production, leading to a choice of region-i schooling by the bourgeois.[8] Mathematically, from equations (2) and (4), the condition under which region-i schooling is preferred is given by

$$\Pi^{R_i}_{B_i} \geqslant \Pi^{U}_{B} \Leftrightarrow I^{U}_{B} - I^{R_i}_{B_i} \geqslant (1-\beta)(1+\mu\sigma)\frac{M}{2}\alpha \tag{7}$$

It is easy to see that for $\alpha = 0$ the bourgeois prefers the cheapest system, just as landowners. Instead, as α becomes larger, a higher relative set-up cost under unified schooling may be worth paying, and particularly so the larger μ.

Clearly, as the costs of education are crucial and these costs partly depend on the identity of the dominant group, the preferences of each elite group over these two systems may depend on the power they can exert at the regional or state level.[9] Section 3.1 characterizes the choice of system when the bourgeois are in full control in the sense that they are politically dominant at the state level and also in each region. Similarly, Section 3.2 considers a situation in which landowners are always dominant. Finally, Sections 3.3 and 3.4 consider two situations in which the statewide dominant elite fails to dominate in one region.

3.1. Bourgeoisie always dominant

Consider first a situation in which the bourgeoisie is dominant in both regions, and thus also statewide dominant. For that case, the following proposition can be stated (see Appendix B.2. for the specific thresholds).

Proposition 2. *A regionally and statewide dominant bourgeoisie (i) always prefers unified to region-2 schooling and (ii) prefers unified to region-1 schooling if (a) market integration α is sufficiently high or (b) α is low but the productivity σ is*

sufficiently high. Finally, if both α and σ are sufficiently low, the region-1 bourgeoisie prefers region-1 schooling.

Proof. See Appendix B.2.

The bourgeoisie is willing to choose a regional organization of education over the unified system only if regional schooling generates cost savings that are able to compensate the lack of cross-regional production. As the bourgeoisie is country-wide dominant and thus in a good position to make landowners pay as much as possible for unified schooling, the choice of regional schooling can only come from a larger size of the bourgeoisie that would alleviate the per-capita cost of regional schooling. Clearly, as the bourgeoisie is smaller in region 2, region-2 schooling is actually always more expensive in per-capita terms than unified schooling and, as a result, region-2 schooling is never chosen.

Instead, region-1 schooling is a potential candidate; Figure 5 illustrates the second part of the proposition for $\mu > \overline{\mu}_1$.[10] Overall, the bourgeoisie prefers unified schooling for sufficiently large values of α and/or σ, i.e., when sufficiently more matches are generated under unified schooling and/or the value of these matches is greater. For $\alpha > \overline{\alpha}$, in particular, education under unified schooling generates so much more output than region-1 education that the bourgeoisie always chooses the unified system whenever education is implemented. At the same time, different subparts of the area where unified schooling is chosen correspond to a different split of the cost among the elites. Indeed, for very large productivity levels ($\sigma > \widehat{\sigma}^N$), education is fully paid by landowners under both systems, and thus the bourgeoisie always chooses the most productive system, i.e., unified schooling. Instead, for $\max(\widetilde{\sigma}_U, \underline{\sigma}_N) < \sigma < \widehat{\sigma}^N$, there is co-payment under both systems and the bourgeoisie chooses unified schooling if and only if σ and α are above $\sigma_{\text{copay\_}B_1}$. Similarly,

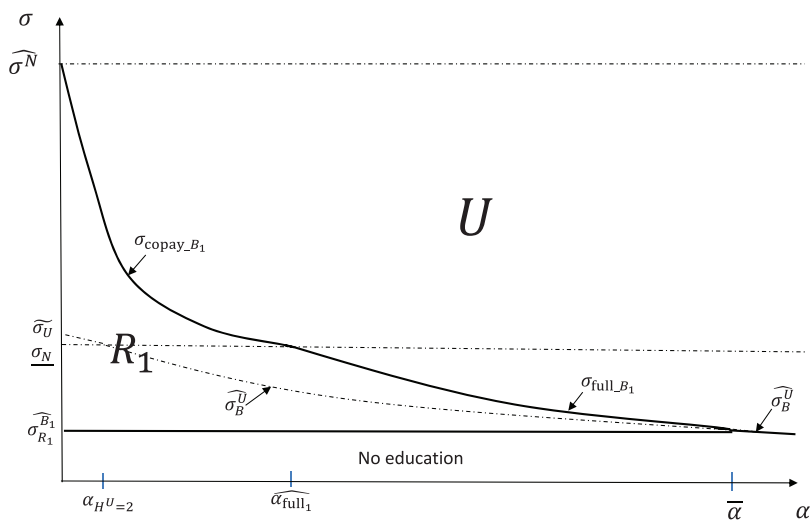

Figure 5. Bourgeoisie always dominant ($\mu > \overline{\mu}_1$).

for lower productivity values ($\widehat{\sigma}_B^U < \sigma < \underline{\sigma}_N$), the bourgeoisie needs to pay all the costs under both systems and chooses unified schooling if and only if σ and α are this time above $\sigma_{\text{full\_}B_1}$. Finally, for very low productivity values, only one education system is viable. Specifically, for $\widehat{\sigma}_B^{R_1} < \sigma < \widetilde{\sigma}_U$, which arises for $\alpha < \overline{\alpha}$, the bourgeoisie is able to fund regional schooling fully, while the limits to cross-regional production imply that fully funding unified schooling is not profitable. Conversely, for $\widetilde{\sigma}_U < \sigma < \widehat{\sigma}_B^{R_1}$, which arises for sufficiently high α ($\alpha < \overline{\alpha}$), the bourgeoisie is willing to finance education fully only under the unified system, given cross-regional production.

Clearly, the implementation of schooling only in region-1 results in the region-2 bourgeoisie retaining the no-education payoff. If region-1 schooling is the only feasible system, the region-2 bourgeoisie will be indifferent between implementing schooling in the other region or not. Instead, if unified schooling is implementable, an outcome better than no education is potentially attainable to them; thus, region-2 bourgeois will oppose region-1 schooling if this is the case. In turn, dominated landowners end up paying an identical amount for education under both systems whenever $\sigma > \underline{\sigma}_N$; thus, they are indifferent in that case. When $\sigma > \underline{\sigma}_N$ and only region-1 schooling is implementable, they are still indifferent because their payoff is made equal to no education by the bourgeois. Finally, for $\sigma < \underline{\sigma}_N$, landowners will oppose any system implemented with full financing by the bourgeois, as this would render them worse off than under no education, and support any other system with partial payment, whenever feasible, as this would keep them at the no-education payoff. Region-2 bourgeois' and landowners' preferences are presented in Proposition 7 in Appendix B.2.1.

3.2. Landowners always dominant

Consider next a situation in which the landowners are in full control. As the payoff from schooling to landowners is the same under both systems, dominant landowners simply choose the system that allows them to transfer a larger share of the cost of schooling to the bourgeois. The following proposition holds.

Proposition 3. *Regionally and statewide dominant landowners always prefer unified to region-2 schooling. Their choice between unified and region-1 schooling is represented in Figure 6 for* $\mu < \overline{\mu}_1$ *and in Figure TA3 in the online appendix for* $\mu > \overline{\mu}_1$.

Proof. See Appendix B.2.2.

Landowners do not benefit directly from cross-regional matches under the unified system, but can benefit indirectly, as bourgeois are more willing to pay for education in that case. Regional schooling becomes attractive in turn when the lower per-capita cost for the bourgeois makes them willing to pay more for regional education, which translates in savings for the landowners. However, this is not possible for region-2 schooling, owing to the small size of its bourgeoisie, and as a result dominant landowners never choose region-2 schooling.

Instead, region-1 schooling might be chosen by landowners, as bourgeois may be willing to pay more for education under that system. Consider Figure 6, where

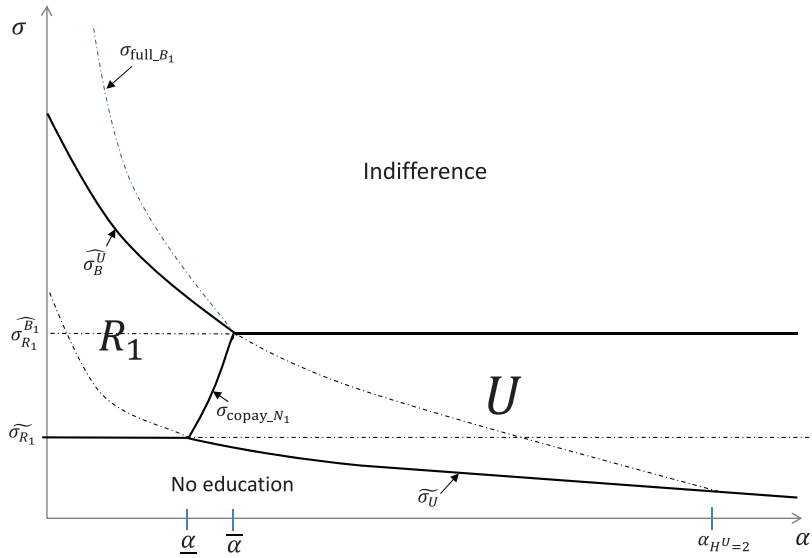

Figure 6. Landowners always dominant ($\mu < \overline{\mu_1}$).

$\mu < \overline{\mu}_1$.[11] Overall, dominant landowners are indifferent between the two systems when productivity shocks are large enough, and for lower productivity levels prefer unified schooling if α is sufficiently large and region-1 schooling instead if α is low. More specifically, indifference in the presence of high productivity shocks is associated with schooling being free for landowners under both systems for $\sigma > \max(\widehat{\sigma}_{B_1}^{R_1}, \widehat{\sigma}_{B_1}^{R_1})$, as the bourgeois pay the full cost. For lower productivity levels but still high market integration ($\alpha > \alpha(\sigma_{\text{copay}\_N_1})$), landowners prefer unified schooling because the large cross-regional production gains make bourgeois willing to pay more under unified schooling (for $\widetilde{\sigma}_{R_1} < \sigma < \max(\widehat{\sigma}_{B_1}^{R_1}, \widehat{\sigma}_{B_1}^{R_1})$) or because these gains explain why unified schooling is the only feasible system (for $\widetilde{\sigma}_U < \sigma < \widetilde{\sigma}_{R_1}$). Conversely, as we move to the left of $\sigma_{\text{copay}\_N_1}$, cross-regional gains become small compared with the savings in region-1 schooling stemming from the high proportion of bourgeois to masses in that region. As a result, for $\widetilde{\sigma}_U < \sigma < \widehat{\sigma}_B^U$ (resp. for $\widetilde{\sigma}_{R_1} < \sigma < \widetilde{\sigma}_U$), the bourgeois are more willing to pay under region-1 schooling (resp. are willing to finance only this system) and landowners choose this system.

Proposition 8 in Appendix B.2.2 studies the preferences of bourgeois and region-2 landowners over the two systems. The dominated bourgeois are shown to share the same preferences as the landowners, except for $\widehat{\sigma}_B^U < \sigma < \sigma_{\text{full}\_B_1}$. Specifically, in this area, landowners are indifferent between the two systems, while bourgeois would prefer region-1 schooling, as the gains from lower per-capita costs of financing schooling under the regional system outweigh the extra match benefits from unified schooling. In turn, region-2 landowners always oppose the choice of region-1 schooling whenever unified schooling is viable, as region-1 schooling leaves them with the no-education payoff.

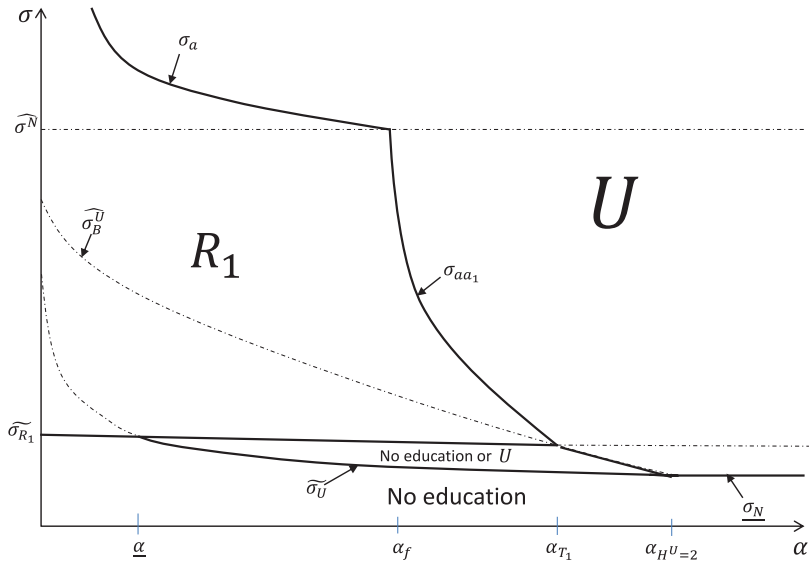

Figure 7. Region-1-dominant but statewide dominated bourgeois ($\mu < \overline{\mu}_1$).

3.3. Region-*i* dominant but statewide dominated bourgeoisie

Consider next a situation in which the landowners are dominant at the state level but the bourgeoisie is dominant in region i, which implies in turn that the landowners are dominant in region $-i$.

Consider first the tradeoff facing a region-i bourgeois: on the one hand, by implementing region i schooling, the region-i bourgeois can shift educational costs to the landowners while they bear most of the costs under unified schooling as they are dominated by the landowners under that system. On the other hand, if unified schooling can be implemented, region-i schooling leads to the loss of valuable match partners in region $-i$ (a loss that is increasing in $\mu\sigma$ and in market integration α). Hence, region-i schooling stands a better chance against unified schooling for lower market integration α and relatively low productivity shocks σ, as shown in the following proposition.

Proposition 4 *The choice of education system by a region-*1 *dominant but statewide dominated bourgeoisie is represented by Figure 7 for* $\mu < \overline{\mu}_1$ *and by Figure 10 in the appendix for* $\mu > \overline{\mu}_1$. *For a region-*2 *dominant but statewide dominated bourgeoisie, it is represented by Figure 11 in the appendix for* $\mu < \overline{\mu}_2$ *and by Figure TA4 in the online appendix for* $\mu > \overline{\mu}_2$.

Proof. See Appendix B.3.

Consider the case where $\mu < \overline{\mu}_1$, represented in Figure 7.[12] For very large productivity levels ($\sigma > \widehat{\sigma}^N$), region-1 bourgeois are made to fully finance education under the unified system and instead do not need to pay anything under region-1

schooling. Yet, given that the high productivity renders cross-regional production very attractive, region-1 bourgeois prefer unified schooling unless the level of market integration is sufficiently low ($\sigma<\sigma_a$). For lower productivity values ($\max(\widehat{\sigma}_B^U, \widetilde{\sigma}_{R_1})<\sigma<\widehat{\sigma}^N$), bourgeois still need to fully pay for education under unified schooling and they now co-finance it under region-1 schooling, which results in them choosing unified schooling for $\sigma>\sigma_{aa}$. Intuitively, both σ_a and σ_{aa} are downward sloping, illustrating that the choice of unified schooling requires a higher and higher market integration level as productivity goes down. Next, for $\max(\widetilde{\sigma}_{R_1}, \widetilde{\sigma}_U)<\sigma<\widehat{\sigma}_B^U$, the bourgeois are made indifferent to no education under unified schooling and instead need to pay only part of the cost of region-1 schooling; for this reason, they choose region-1 schooling. Finally, for $\widetilde{\sigma}_U<\sigma<\widetilde{\sigma}_{R_1}$, only unified schooling is feasible and the bourgeois can be in two possible situations: if $\sigma<\widehat{\sigma}_B^U$, the countrywide dominant landowners make them indifferent to no education; instead, for $\sigma>\widehat{\sigma}_B^U$ their outcome is better than under no education, and they thus prefer unified schooling.

Unlike in the two cases where the same elite exerts power regionally and countrywide, region-2 schooling is now an equilibrium outcome: indeed, while the two disadvantages from region-2 schooling – i.e., the loss of cross-regional production and the high per-capita cost of education – are still present, these can be now overcome by the shift in the balance of power in favour of the bourgeoisie at region-2 level (see Figures 11 and TA4). As region-2 is bourgeois-scarce, it can be considered relatively backward and related to Gellner's (2006) Ruritania. Interestingly, as in Gellner's discussion, Ruritanian nationalism is more likely in the presence of some prior 'barrier to communication' or heterogeneity between the two regions.

While region-*i* bourgeois prefer, in some cases, the implementation of region-*i* schooling, Proposition 9 in Appendix B.3 shows that statewide dominant landowners never prefer region-*i* schooling to unified schooling and, in most cases, actually oppose it.

3.4. Region-*i* dominant but statewide dominated landowners

Since landowners do not benefit from regional mobility, they prefer region-*i* education whenever their educational costs are lower under this system. Proposition 5 shows this to be the case for regionally dominant but statewide dominated landowners.

Proposition 5. *Region-i dominant but statewide dominated landowners always prefer region-i schooling whenever education is implementable under that system. In situations in which only unified schooling is implementable, this system never makes them better off than no education.*

Proof. See Appendix B.4.

Landowners prefer regional schooling because they are the dominant group under that system, which implies that they can shift (part of) the educational costs to the bourgeoisie and hence implement schooling, paying less than they would under the unified system, where they are the main bearers of the educational cost.

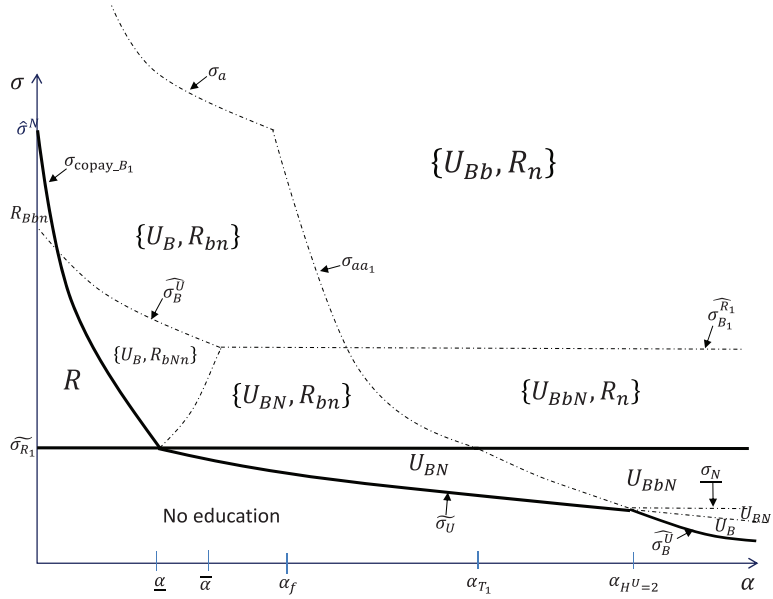

Figure 8. Choice of the system depending on the dominant group ($\mu < \overline{\mu_1}$).

When unified schooling is the only implementable system, this system leaves them either indifferent or worse off than under no education, so they never strictly prefer it. Proposition 6 shows that attempts by region-*i* landowners to implement region-*i* education will be opposed by the bourgeois except when the region in question is region 1 and both market integration and productivity are low enough.

Proposition 6. *The statewide dominant bourgeoisie prefers to be regionally dominated under* R_1 *if* $\widetilde{\sigma}_U < \sigma < \sigma_{y_1}$ *and* $\mu < \overline{\mu}_1$ *or if* $\max(\widetilde{\sigma}_U, \underline{\sigma_N}) < \sigma < \min[\widehat{\sigma}_N^U, \sigma_{y_1}]$ *and* $\mu > \overline{\mu}_1$ *(arising for, respectively,* $\alpha < \alpha_{s_i}$ *and* $\alpha < \widehat{\alpha}_{\text{full}}$*). In all the rest of the cases, the bourgeoisie prefers U (opposes regional schooling).*

Proof. See Appendix B.4.

While the statewide dominant bourgeoisie generally prefers unified schooling, if both productivity and market integration are low enough, it might prefer to be dominated under region-1 schooling, given the lower per-capita costs of schooling. As for the landowners from the other region, who are both regionally and statewide dominated, we know from Proposition 7 that they will be indifferent unless one system can be implemented and fully financed by the bourgeoisie, in which case they will prefer the other one (if viable) or no education.

3.5. Choice of system and dominant group

When and how does the choice of the system depend on the identity of the dominant group? Figure 8 provides the answer for the choice between region-1 and

unified schooling for $\mu < \overline{\mu}_1$,[13]. where, for system $S = \{U, R\}$, S_B (resp. S_N) denotes that statewide and regionally dominant bourgeois (resp. landowners) choose system S and S_b (resp. S_n) denotes that regionally dominant but statewide dominated bourgeois (resp. landowners) choose system S.[14]

Independently of the politically dominant group, no education system is set up for sufficiently low productivity shocks. For higher productivity but small market integration ($\widetilde{\sigma}_{R_1} < \sigma < \sigma_{\text{copay\_}B_1}$), i.e., in the south-west of the figure, the identity of the dominant group does not matter either and region-1 schooling is systematically implemented. The same applies for the unified system for relatively low productivity but sufficiently high market integration (for $\max(\widetilde{\sigma}_U, \underline{\sigma}_N, \widehat{\sigma}_B^U) < \sigma < \widetilde{\sigma}_{R_1}$). However, for most of the parameter space, the outcome does depend on the identity of the dominant group, with dominant bourgeois systematically choosing unified schooling, regionally only dominant landowners systematically preferring region-1 schooling and dominant landowners and regionally dominant bourgeois shifting from a preference for region-1 schooling to one for unified schooling as market integration becomes larger.

4. Historical evidence

This section studies, for 1870–1920, the educational choices and nation building outcomes of five European countries with different power configurations among their elites. To this purpose, we first present each country separately and then discuss their outcomes in the light of our model using the development of railways as a proxy for market integration and GDP per capita as a proxy for the industrialization shock.

4.1. France

In mid-nineteenth century France, most of the industries were concentrated in the north-east, north of the 'St-Malo-Geneva' line (see, e.g., Weber, 1976). Price (2004) argues that the *grande bourgeoisie* was dominant in French politics since 1830, and this domination seems to apply both to the north-east, where the industrial bourgeoisie was mostly located, and to the rest of the country, with the increasing role in the implementation of the 1870–1914 reforms of the Radical Party, which represented petty bourgeois groups (Magraw, 1983).

The Ferry laws in the 1880s instituted free schooling throughout France, with French becoming the only language of instruction. After this reform, in 1910, individuals aged 15 or over had an average of 6.99 years of education (Morrisson and Murtin, 2009), the second highest level in Europe after Switzerland. As argued by Weber (1976), this reform also led to the spread of the French language and the French identity throughout the country.

Politically, France is often used as a benchmark of successful nation building (see, e.g., Kroneberg and Wimmer, 2012) and the success (or even the existence) of regionalist or nationalist parties in Alsace, Brittany, Corsica or the French parts of the Basque Country or Catalonia has been very limited. For instance, in the first

round of the April 1928 French legislative elections, regionalist candidates were only present in Alsace and obtained 15.9% of the votes (see Lachapelle, 1928).

In terms of our model, this reform thus corresponds to the implementation of unified schooling by a state- and regionwide dominant bourgeoisie.

4.2. Spain

In Spain, the first industries (mainly textiles) were mostly concentrated in Catalonia and in the Basque Country (Tortella, 2000). According to Linz (1975), the Catalan bourgeoisie was unable to gain power at the Spanish state level and thus aimed instead at securing power at the regional level, building up support on the basis of cultural nationalism. Thus, while the bourgeoisie was dominant in Catalonia and the Basque Country (Linz, 1974), at the Spanish-wide level, it was 'the agrarian and financial interests of central and southern Spain who made up the political oligarchy' (Harrison, 1976, p. 902).

The development of the education system was limited, with an average of 4.63 years of education in 1910 (Morrisson and Furtin, 2009). At the same time, Vilanova and Moreno (1992) show that in the period 1887–1920, the illiteracy rate fell much more quickly in Catalonia (from 60% to 29%) than in Spain as a whole (from 65% to 44%). According to Balcells (2013, p. 478), this differential evolution in the development of schooling was partly the result of political choice at the Catalan level[15] and '[these schools] socialized a first generation of literate citizens with values of either suspicion against the Spanish state or love for the Catalan nation.'

When elections were held, peripheral nationalist parties were systematically represented in the Spanish Parliament since the end of the nineteenth century. For instance, in the June 1931 Spanish legislative elections, the Catalan nationalist parties obtained almost three-quarters of the Catalan constituencies (see Tusell, 1982).

Given the differential development of education and the strength of the Catalan identity, we could argue that – in terms of our model – the Spanish case corresponds to the implementation of regional education in Catalonia by a regionally dominant but statewide dominated bourgeoisie.

4.3. Hungary

According to Good (1994), industrialization in Hungary (mainly in the food-processing sector) was mostly concentrated in lower-western Hungary (including the Budapest region) and upper-western Hungary (including current day Slovakia), while eastern Hungary, Transylvania and Croatia-Slavonia were more backward. Politically, within the large autonomy of the Kingdom of Hungary following the 1867 Austro-Hungarian compromise, there was 'aristocratic dominance of Hungarian politics from the 1860s revival of Magyar politics to the end of the monarchy' (Freifeld, 2000, p. 57) and this dominance applied to both regions (see also Mason, 1997).

An important investment in education was conducted throughout the entire country, with primary school enrolment increasing from 324,000 to 2.5 million in 1849–1900 (Janos, 1981). By 1910, the average number of years of schooling was 3.82, which was still smaller than Spain but catching up some of the gap existing in 1870. While Magyars accounted for less than 40% of the population in 1846 (Freifeld, 2000), 'in the case of Hungary, this process was further stimulated by the desire to create an ethnically homogeneous society, and by the conscious use of the school system as an instrument of national integration' (Janos, 1981, p. 156). This was done through 'an aggressive Magyarization of the elementary schools' (Freifeld, 2000, p. 240), starting in 1879.

In terms of our model, the Hungarian case can thus be characterized as the implementation of a unified system in a situation where the nobility is state and region wide dominant.

4.4. Finland

In Finland, following the large autonomy associated with the status of Grand Duchy within the Russian Empire (received in 1809 and respected until 1899), 'domination within the country – political, economic and cultural – was in the hands not of the Russians but of the Swedish-speaking upper class' (Alapuro, 1988, p. 90), which 'did not have a solid basis in landownership' (p. 91). Alapuro (1988, p. 62) identifies south-western Finland and the southern area of the county of Viipuri as the 'gravitational centre of industrialisation' led by the Swedish-speaking upper classes and with sawmilling as the leading sector, while the rest of the country, mostly inhabited by Finnish-speaking landowners, constituted the periphery.

While reading levels were already high since at least the mid-eighteenth century for religious reasons (Myllyntaus, 1990), writing ability was very poor. To tackle this and to develop nationalist and religious values, a system of non-compulsory municipal primary schools (*kansakoulu*) was approved in 1866 by the Finnish Senate. However, the system developed well only in cities (Westberg et al. 2018) and by 1900 the average number of years of schooling was only 0.769 (Morrisson and Murtin, 2009). Following its independence from Russia in 1917, Finland was in 1921 one of the latest countries in Western Europe to introduce compulsory school attendance, with the average number of years of schooling growing quickly at that point to reach 3.12 in 1940.

In terms of our model, the Finnish case can thus be characterized as a situation of country- and regionwide dominant bourgeoisie leading to a no-education outcome in the 1860s and to the implementation of a unified system in the 1920s.

4.5. Italy

At unification (1861–1870), the south of Italy had a lower GDP per capita than the centre-north (Felice, 2013) and also experienced higher illiteracy rates (A'Hearn et al., 2011). Overall, modernization and capitalistic production were confined to agriculture (Romeo, 1959) and 'the first Italian ruling class (...) [was] mostly

composed of landowners and aristocrats, almost always from the centre-north' (Macry, 2012, p. 103). By the Giolittian period (1901–1914) instead, the interests of the centre-northern bourgeoisie were guiding the industrialization process (Macry, 2012).

The initial system was based on the Piedmontese Casati law (1859) establishing 2 years of free primary school, but leaving the implementation to municipalities (Felice, 2013). Although successive laws extended schooling, by 1890 the average number of years was only 1.87 (Morrisson and Murtin, 2009), well below the Hungarian or Spanish levels. As argued by Cappelli (2015), the low levels of schooling were due to the financial constraints of municipalities and also to the perception that schooling was not a valuable investment, particularly in the south. In 1911, the Daneo–Credaro reform centralized the payment of teachers' salaries, resulting in a surge (especially in the south) in educational enrolment (Cappelli, 2015), reaching 4.24 years of education in 1940 (Morrisson and Murtin, 2009).

In terms of our model, the Italian case in the 1860s can be represented as the choice of no education by the countrywide and regionally dominant landowners of the north, and instead the choices in the Giolittian period as the implementation of unified schooling by the countrywide and regionally dominant bourgeoisie from the north.

4.6. Discussion

Figure 9 represents the educational choices of these countries in the period 1860–1920 using data from Martí-Henneberg (2013) on kilometre of railway per square kilometre and from Maddison (2003) on GDP per capita. This graph is interpreted as the empirical counterpart of Figure 8, with the development of railways and

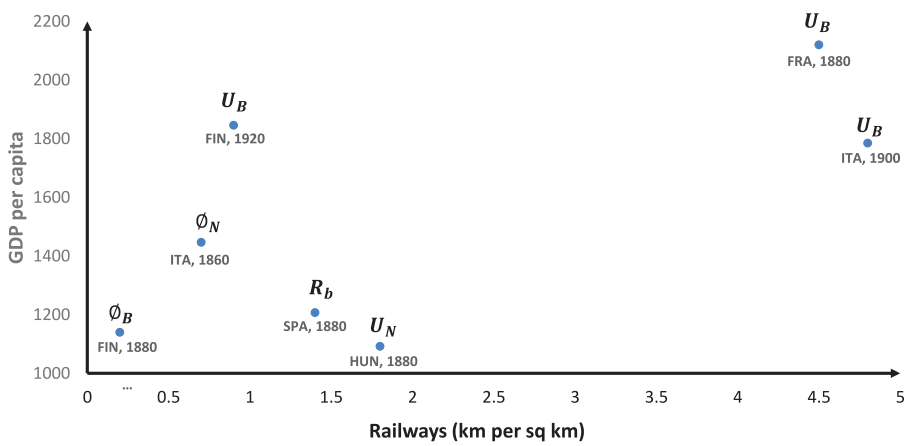

Figure 9. Choice of educational system in five European countries (1860–1920).
FIN: Finland; FRA: France; HUN: Hungary; ITA: Italy; SPA: Spain.

GDP per capita as proxies for, respectively, market integration (α) and industrialization shock (σ).

Empirically, no education arises for low levels of railway development and GDP per capita, which is compatible with Figure 8 from the model simply because investment in education is less profitable for low values of α and/or σ.

In turn, at the other extreme of Figure 9, bourgeois-dominated countries with relatively well developed railway networks and high GDP per capita as France in 1880 and Italy in 1900 chose unified education, which is compatible with the prevalence of unified education in the model for high α and σ under bourgeois dominance.

Finally, while Spain and Hungary in 1880 shared quite similar levels of GDP per capita and railway development, these two countries differed in terms of the power structure, and only Hungary chose a unified system. This is compatible with the area in Figure 8 where $\{U_{BN}, R_{bn}\}$ holds, i.e., where region- and statewide dominant landowners (as in Hungary) choose unified schooling, while regionally dominant bourgeois (as in Spain) choose regional schooling.

5. Conclusion

In this paper, a Gellnerian model of industrialization and nation building is presented, emphasizing the key role of elites in shaping that process. As in Gellner (1964, 2006), the central link between industrialization and nation building goes through the double role of schooling as productivity enhancer and generator of a common identity. In addition, as in more recent contributions to the nation building literature (see, in particular, Breuilly, 1993; Kroneberg and Wimmer, 2012; Roeder, 2007), the observed outcome in terms of industrialization and nation building crucially depends on the nature of the interaction between elite groups with different (and sometimes diverging) interests.

Starting from a non-unified state constituted of two regions, the implementation of a common education system that transforms the state into a nation state has the advantage of expanding output by enabling inter-regional production, although following Gellner's (2006)'barriers to communication', this might only be achieved to a certain extent.

If these barriers are not too strong and productivity is large, a common education system will indeed be the outcome if the identity of the dominant group is the same at the regional and state levels: intuitively, an elite that is dominant at both geographical levels can appropriate a large share of the cake at both levels, and thus goes for the implementation of education at the level where the cake is the largest, i.e., at the state level. However, if the barriers are strong or productivity is not high, restraining schooling to the bourgeois-abundant region pays-off, as this reduces per-capita education costs.

Instead, a regionally dominant but statewide dominated elite might prefer a large share of the small (regional) cake rather than a small share of the large cake stemming from building a nation state, even if barriers to communication are not particularly large. When regional and statewide power are not in the same hands,

it may even happen that the elite of a backward (bourgeois-scarce) region chooses to implement regional schooling, as for Gellner's Ruritania.

While a full empirical test of our model is beyond the scope of this paper, our analysis of the school set-up decisions in five European countries in 1860–1920 shows that our model is able to generate some broad historical features, such as the importance of market integration or the geographical distribution of power.

Clearly, our model is highly stylized and cannot match some important features characterizing countries that include a peripheral nation. In particular, while in our model the emergence of a peripheral nation always comes (by construction) with the failure of nation building at the state level, such countries as Canada, Belgium, Spain or the UK, which include regional nations, have also developed a (stronger or weaker) national identity at the state level – which clearly makes institutional design difficult.

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Supplemental material

Supplemental material for this article is available online.

Notes

1. Gellner (2006, p. 61) argues that the principle of 'barriers to communication, barriers based on previous, pre-industrial cultures' is one of the 'principles of fission which determine the emergence of new units', and one that 'operates with special force during the early period of industrialization.'

2. The same hypothesis is made in Galor et al. (2009). Empirically, Lindert (2004) refers to examples of resistance of landlords to education in nineteenth-century England and Germany, and Ager (2013) shows that counties with richer planters before the American Civil War invested less in human capital and were less productive in the twentieth century.
3. For a formal model of schooling as an instrument for language uniformization, see Ortega and Tangerås (2008).
4. See, in particular, Balcells (2013) and Linz (1974) for Spain, Weber (1976) for France, Freifeld (2000) for Hungary, Alapuro (1988) for Finland and Macry (2012) for Italy.
5. See Alesina et al. (2018), Aspachs-Bracons et al. (2008), Balcells (2013), Clots-Figueras and Masella (2013) and Darden and Grzymala-Busse (2006) for papers underlining the importance of education for nation building.
6. A system characterized by the implementation of education in only one region but with financing at the state level (i.e., with subsidization within each elite groups across regions) is always dominated by regional schooling. Indeed, while a state-level funded regional system is attractive to the regional elite in terms of reducing the per-capita cost of education, such a system comes with the associated disadvantage of sharing the benefits of education, which are increasing in the productivity level. As shown in the online appendix, for relevant productivity levels (i.e., those for which education is implemented), the loss associated with sharing the benefits always dominates; thus, regional schooling is preferred. Similarly, the simultaneous implementation of two regional education systems financed at the state level is dominated by unified schooling, because the overall costs of schooling would be identical under both systems, but the double regional system would not create a common identity and thus inter-regional production would not be possible.
7. The landowners could implement education in this case too if the bourgeois could credibly commit to transfer to them an amount of resources greater than the full cost of education.
8. Region-2 bourgeois are less likely to choose region-2 schooling than region-1 bourgeois are to choose region-1 schooling. Indeed, as the number of bourgeois in region 2 is small, the per-bourgeois cost of education is higher, and generating a cost reduction is more difficult. The same type of argument applies to landowners, this time because region-2 bourgeois have a lower willingness to finance region-2 education. Mathematically, we always have that $H^{R_2} < H^U$, while we can have either that $H^{R_1} < H^U$ or that $H^{R_1} > H^U$.
9. In Appendix B.1, we rank the productivity thresholds underlying Lemma 1 across different education systems. This is needed to calculate the different per-capita educational costs for unified and regional education that fall on landowners and bourgeois for each industrialization shock under different power configurations.
10. Observe that $\mu > \overline{\mu}_1$ if and only if $H^{R_1} > 2$ and thus regional education is always as represented by Figure 3, and we have that $H^U < 2$ if and only if $\alpha < \alpha_{H^U=2}$. The case for $\mu < \overline{\mu}_1$ is similar and presented in Figure TA2 in the online appendix, the only qualitative difference being that regional schooling is only implementable when it benefits both the elite groups, so that there is no area where regional schooling is fully financed by the dominant bourgeoisie.
11. In this case, we always have that $H^{R_1} < 2$ and thus regional education is always represented by Figure 4, and we have that $H^U < 2$ if and only if $\alpha < \alpha_{H^U=2}$. In the case for $\mu > \overline{\mu}_1$ (see Figure TA3 in the online appendix), $H^{R_1} > 2$; in that case (see Figure TA1 in the online appendix) the incentives of bourgeois for region-1 schooling are high and for

that reason region-1 landowners can implement that system without paying anything. In turn, this implies that U is never preferred to R_1 by region-1 landowners in this case (see Figure TA3).

12. The case for $\mu > \overline{\mu}_1$ (see Figure 10 in the appendix) is similar, except that (i) there is no region in which unified schooling is the only feasible system and (ii) region-1 schooling is the only feasible system and is preferred by the bourgeois for any value of α whenever $\widehat{\sigma}_{B_1}^{R_1} < \sigma < \underline{\sigma}_N$, corresponding to a situation where the bourgeois fully pay for education and make the landowners worse off than their no-education outcome (see Figure 3).
13. The case for $\mu > \overline{\mu}_1$ (see Figure TA5 in the online appendix) is similar, except that for relatively low values of σ (specifically, for $\widehat{\sigma}_{B_1}^{R_1} < \sigma < \underline{\sigma}$) education is only implemented when the bourgeois are dominant, as their incentives for education are much stronger (μ is large). Dominant bourgeois are willing to fully finance education and make landowners worse off than under no education, while dominant landowners use their power to stop schools from being set up.
14. Whenever a dominant group is not mentioned in a region, this means that the group is indifferent between R_1 and U in that specific region.
15. An institution linking the four Catalan provinces (the *Mancomunitat*) was created in 1914. Although it did not have control of the educational system, the *Mancomunitat* created some new schools in Catalan. The stronger development of schooling in Catalonia was also due to private initiatives by the Catalanist movement, the anarchists and other popular movements, and the Catholic Church.

Appendix A. Cutoffs and educational costs for the elite

The productivity shock that makes the elite indifferent between implementing U or not is such that $\Pi_e^U = \Psi_e$ with $e = N, B$. From equations (1), (2) and (3), the thresholds for the bourgeoisie and the landowners are, respectively

$$\sigma_B^U = \frac{2I_B^U + (1-\beta)M(1-\alpha)}{(1-\beta)\mu M(1+\alpha)} \quad \text{and} \quad \sigma_N^U = \frac{2I_N^U + (1-\beta)M}{(1-\beta)M}$$

Under R_i, equalizing equations (4) and (5) with equation (1), the productivity thresholds are, respectively

$$\sigma_{B_i}^{R_i} = \frac{2I_{B_i}^{R_i} + (1-\beta)M}{\mu(1-\beta)M} \quad \text{and} \quad \sigma_{N_i}^{R_i} = \frac{2I_{N_i}^{R_i} + (1-\beta)M}{(1-\beta)M}$$

Let e (resp. $-e$) denote the dominant (resp. dominated) group and E (resp. E^-) its size. Then, educational costs are split as follows:

(i) For $\sigma > \max\left[\underline{\sigma}_e^k, \widehat{\sigma}_{-e}^k\right]$, $I_e^k = 0$, and schooling is fully financed by the dominated group. Under U, each member of the dominated group pays $\widehat{I}_{-e}^U = M/E^-$, since the masses of both regions get educated. Under R_i, the cost becomes $\widehat{I}_{-e}^{R_i} = M/2E_i^-$.

(ii) If $\max\left[\underline{\sigma}_e^k, \widehat{\sigma}_{-e}^k\right] = \widehat{\sigma}_{-e}^k$:

(iia) Then for $\max\left[\widetilde{\sigma}_e^k, \underline{\sigma_{-e}^k}\right] < \sigma < \widehat{\sigma}_{-e}^k$, the dominant group has to co-finance education, paying $\widetilde{I_e^k}$, while the dominated group pays $\overline{I_{-e}^k}$. The value of $\widetilde{I_e^k}$ for the two systems is $\widetilde{I_e^U} = (M - \overline{I_{-e}^U} E^-)/E$ and $\widetilde{I_e^{R_i}} = (M/2 - \overline{I_{-e}^{R_i}} E_i^-)/E_i$.

(iib) If $\max\left[\widetilde{\sigma}_e^k, \underline{\sigma_{-e}^k}\right] = \underline{\sigma_{-e}^k}$ and $\max\left[\underline{\sigma_{-e}^k}, \widehat{\sigma}_e^k\right] = \underline{\sigma_{-e}^k}$, then for $\widehat{\sigma}_e^k < \sigma < \underline{\sigma_{-e}^k}$, the dominant group wants education, but the dominated group is made worse off with education, so the dominant group fully pays the educational costs, namely M/E and $M/2E_i$ under, respectively, U and R_i.

(iii) In all other cases, the dominant group has no interest in implementing schooling.

Table 1 reports the productivity thresholds and payments under the two systems. Observe that $\tilde{\sigma}_{R_1} < \tilde{\sigma}_{R_2}$ always and $\widehat{\sigma}_{B_1}^{R_1} < \sigma_{B_2}^{R_2}$ always.

Appendix B. Unified versus region-*i* education

B.1 The ranking of the thresholds

To study the preferences of the elites between U and R_i, we first rank the productivity cutoffs under the two systems. Lemma 2 singles out the cutoffs that depend on α.

Lemma 2

(i) $\widetilde{\sigma}_N^U = \widetilde{\sigma}_B^U > \widetilde{\sigma}_{B_1}^{R_1} = \widetilde{\sigma}_{N_1}^{R_1} \Leftrightarrow \alpha < \underline{\alpha}_1 \equiv \underline{\alpha}$, *where* $\underline{\alpha}_i \equiv \frac{[2\mu + (1-\beta)(\mu-1)N](B_i - B_{-i})}{B(2\mu + (1-\beta)(N + N\mu + 4\mu B_i))}$ *for* $i = 1, 2$.

(ii) $\widetilde{\sigma}_N^U = \widetilde{\sigma}_B^U < \widetilde{\sigma}_{B_2}^{R_2} = \widetilde{\sigma}_{N_2}^{R_2}$ *always.*

(iii) $\widehat{\sigma}_B^U > \widehat{\sigma}_{B_1}^{R_1} \Leftrightarrow \alpha < \overline{\alpha}_1 \equiv \overline{\alpha}$, *where* $\overline{\alpha}_i \equiv \frac{B_i - B_{-i}}{B(1 + 2(1-\beta)B_i)}$ *for* $i = 1, 2$.

(iv) $\widehat{\sigma}_B^U < \widehat{\sigma}_{B_2}^{R_2}$ *always.*

(v) $\widehat{\sigma}_{N_i}^{R_i} > \widehat{\sigma}_{B_i}^{R_i} \Leftrightarrow \mu > \mu_{N_i}$, *where* $\mu_{N_i} = \frac{N + (1-\beta)NB_i}{(2 + (1-\beta)N)B_i}$ *for* $i = 1, 2$.

(vi) $\widehat{\sigma}_N^U = \widehat{\sigma}_{N_i}^{R_i} < \widehat{\sigma}_B^U$ *whenever* $\alpha < \alpha_P$, *where* $\alpha_P = \frac{2N - 2B\mu - (1-\beta)NB(\mu-1)}{B(2\mu + (1-\beta)N(\mu+1))}$

(vii) $\widehat{\sigma}_B^U > \widetilde{\sigma}_{e_i}^{R_i}$ *whenever* $\alpha < \alpha_{T_i}$, *where* $\alpha_{T_i} = \frac{2N + 2\mu(B_i - B_{-i}) - (1-\beta)BN(\mu-1)}{B(2\mu + (1-\beta)((N(1+\mu) + 4\mu B_i))}$

(viii) $\widehat{\sigma}_{N_i}^{R_i} > \widetilde{\sigma}_{e_i}^{R_i}$ *always.*

(ix) *If* $\widehat{\sigma}^{R_i}_{N_i} < \widehat{\sigma}^{U}_{B}$ *then* $\widehat{\sigma}^{U}_{B} > \widetilde{\sigma}^{R_i}_{e_i}$.

(x) $\widetilde{\sigma}^{U} < \widehat{\sigma}^{R_i}_{B_i} \Leftrightarrow \alpha > \alpha_{s_i}$, *where*
$\alpha_{s_i} = \frac{\mu(B_i - B_{-i}) + (1-\beta)B_i N(\mu-1) - N}{(2(1-\beta)B_i + 1)B\mu}$

(xi) $H^{U} < 2 \Leftrightarrow \alpha < \alpha_{H^{U}=2}$, *where*
$\alpha_{H^{U}=2} = \frac{2-(1-\beta)(\mu-1)B}{(1-\beta)(\mu+1)B}$

Proof. By simple algebra and noticing that $\underline{\alpha}_i > 0$ and $\overline{\alpha}_i > 0$ only for $B_i > B_{-i}$.

Lemma 3

(i) $H^{R_i} < 2 \Leftrightarrow \mu < \overline{\mu}_i$, *where*

$$\overline{\mu}_i = \frac{B_i(1-\beta) + 1}{B_i(1-\beta)} \tag{8}$$

(ii) $\alpha_{H^{U}=2} = 0$ for $\mu < \mu_H$, *where* $\mu_H = (2 + (1-\beta)B)/((1-\beta)B)$.

(iii) $\overline{\mu}_1 < \mu_H < \overline{\mu}_2$.

(iv) $\mu_{N_i} < \overline{\mu}$ *always.*

(v) $\alpha_P < \alpha_{H^{U}=2}$ *always.*

(vi) $\alpha_P < \underline{\alpha}_i \Leftrightarrow \mu > \mu_{P_i}$ *and* $\mu_{P_i} < \mu_{N_i} < \overline{\mu}_i$, *where*
$\mu_{P_i} = \frac{N(1 + B_i(1-\beta))}{B_i(2 + (1+B)(1-\beta))}$

(vii) $\alpha_{s_1} < \underline{\alpha}_1 < \overline{\alpha}_1 < \alpha_{T_1} < \alpha_{H^{U}=2}$, *when* $\mu < \overline{\mu}_1 \Leftrightarrow H^{R_1} < 2$.

(viii) $\alpha_{s_1} > \underline{\alpha}_1 > \overline{\alpha}_1 > \alpha_{T_1} > \alpha_{H^{U}=2}$, *when* $\mu > \overline{\mu}_1 \Leftrightarrow H^{R_1} > 2$.

(ix) $\alpha_{T_2} < \alpha_{H^{U}=2}$, *when* $\mu < \overline{\mu}_2 \Leftrightarrow H^{R_2} < 2$ *and*
$\alpha_{T_2} > 0 \Leftrightarrow \mu < \frac{2N + (1-\beta)BN}{(2(B_1 - B_2) + (1-\beta)BN)}$

(x) *For* $\mu > \overline{\mu}_2 \Leftrightarrow H^{R_2} > 2$, *we always have* $H^{U} > 2$ *since* $\alpha_{H^{U}=2} < 0$.

Proof. By simple algebra, comparing the corresponding cutoffs.

Lemma 4 provides the general rank of the productivity threshold under U and R_i.

Lemma 4. *The productivity thresholds are ranked as follows*:

1. If $\mu < \overline{\mu_1}$ (*region 1*):
   (i) *For* $\alpha < \alpha_{s_1}$: $\underline{\sigma_N} < \widetilde{\sigma}^{R_1}_{B_1} = \widetilde{\sigma}^{R_1}_{N_1} < \widehat{\sigma}^{R_1}_{B_1} < \widetilde{\sigma}^{U}_{N} = \widetilde{\sigma}^{U}_{B} < min[\widehat{\sigma}^{R_i}_{N_i} = \widehat{\sigma}^{U}_{N}, \widehat{\sigma}^{U}_{B}]$, *with* $\widehat{\sigma}^{R_1}_{N_1} = \widehat{\sigma}^{U}_{N} < \widehat{\sigma}^{U}_{B}$ *for* $\alpha < \alpha_P$.
   (ii) *For* $\alpha_{s_1} < \alpha < \underline{\alpha}$:
      (iia) $\sigma_N < \widetilde{\sigma}^{R_1}_{B_1} = \widetilde{\sigma}^{R_1}_{N_1} < \widetilde{\sigma}^{U}_{N} = \widetilde{\sigma}^{U}_{B} < \widehat{\sigma}^{R_i}_{N_i} = \widehat{\sigma}^{U}_{N} < \widehat{\sigma}^{R_1}_{B_1} < \widehat{\sigma}^{U}_{B}$ *for* $\mu < \mu_N$.
      (iib) $\underline{\sigma_N} < \widetilde{\sigma}^{R_1}_{B_1} = \widetilde{\sigma}^{R_1}_{N_1} < \widetilde{\sigma}^{U}_{N} = \widetilde{\sigma}^{U}_{B} < \widehat{\sigma}^{R_1}_{B_1} < min\left[\widehat{\sigma}^{R_1}_{N_1} = \widehat{\sigma}^{U}_{N}, \widehat{\sigma}^{U}_{B}\right]$ *for* $\mu > \mu_N$ *and* $\widehat{\sigma}^{R_1}_{N_1} = \widehat{\sigma}^{U}_{N} < \widehat{\sigma}^{U}_{B}$ *for* $\alpha < \alpha_P$.
   (iii) *For* $\underline{\alpha} < \alpha < \overline{\alpha}$:
      (iiia) $\underline{\sigma_N} < \widetilde{\sigma}^{U}_{N} = \widetilde{\sigma}^{U}_{B} < \widetilde{\sigma}^{R_1}_{B_1} = \widetilde{\sigma}^{R_1}_{N_1} < \widehat{\sigma}^{R_i}_{N_i} = \widehat{\sigma}^{U}_{N} < \widehat{\sigma}^{R_1}_{B_1} < \widehat{\sigma}^{U}_{B}$ *for* $\mu < \mu_N$.
      (iiib) $\underline{\sigma_N} < \widetilde{\sigma}^{U}_{N} = \widetilde{\sigma}^{U}_{B} < \widetilde{\sigma}^{R_1}_{B_1} = \widetilde{\sigma}^{R_1}_{N_1} < \widehat{\sigma}^{R_1}_{B_1} < \widehat{\sigma}^{U}_{B} < \widehat{\sigma}^{R_1}_{N_1} = \widehat{\sigma}^{U}_{N}$ *for* $\mu > \mu_N$ (*since* $\alpha_P < \underline{\alpha}$ *for* $\mu > \mu_N > \mu_P$, so $\widehat{\sigma}^{U}_{N} = \widehat{\sigma}^{R_i}_{N_i} > \widehat{\sigma}^{U}_{B}$ *always*).
   (iv) *For* $\overline{\alpha} < \alpha < \alpha_{T_1}$: $\underline{\sigma_N} < \widetilde{\sigma}^{U}_{N} = \widetilde{\sigma}^{U}_{B} < \widetilde{\sigma}^{R_1}_{B_1} = \widetilde{\sigma}^{R_1}_{N_1} < \widehat{\sigma}^{U}_{B} < min\left[\widehat{\sigma}^{R_1}_{N_1} = \widehat{\sigma}^{U}_{N}, \widehat{\sigma}^{R_1}_{B_1}\right]$.

(v) For $\alpha_{T_1}<\alpha<\alpha_{H^U=2}$: $\underline{\sigma_N}<\widetilde{\sigma}_N^U=\widetilde{\sigma}_B^U<\widehat{\sigma}_B^U<\widetilde{\sigma}_{B_1}^{R_1}=\widetilde{\sigma}_{N_1}^{R_1}<min\left[\widehat{\sigma}_{N_1}^{R_1}=\widehat{\sigma}_N^U,\widehat{\sigma}_{B_1}^{R_1}\right]$.

(vi) For $\alpha>\alpha_{H^U=2}$: $\widehat{\sigma}_B^U<\underline{\sigma_N}<\widetilde{\sigma}_{B_1}^{R_1}=\widetilde{\sigma}_{N_1}^{R_1}<min\left[\widehat{\sigma}_{N_1}^{R_1}=\widehat{\sigma}_N^U,\widehat{\sigma}_{B_1}^{R_1}\right]$.

2. *If* $\mu>\overline{\mu}_1$ (*region 1*):

(i) For $\alpha<\alpha_{H^U=2}$, $\widehat{\sigma}_{B_1}^{R_1}<\underline{\sigma_N}<\widetilde{\sigma}_N^U=\widetilde{\sigma}_B^U<min\left[\widehat{\sigma}_{N_1}^{R_1}=\widehat{\sigma}_N^U,\widehat{\sigma}_B^U\right]$ and $\widehat{\sigma}_{N_1}^{R_1}=\widehat{\sigma}_N^U<\widehat{\sigma}_B^U$ for $\alpha<\alpha_P$.

(ii) For $\alpha_{H^U=2}<\alpha<\overline{\alpha}$, $\widehat{\sigma}_{B_1}^{R_1}<\widehat{\sigma}_B^U<\underline{\sigma_N}<\widehat{\sigma}_{N_1}^{R_1}=\widehat{\sigma}_N^U$.

(iii) For $\alpha>\overline{\alpha}$: $\widehat{\sigma}_B^U<\widehat{\sigma}_{B_1}^{R_1}<\underline{\sigma_N}<\widehat{\sigma}_{N_1}^{R_1}=\widehat{\sigma}_N^U$.

3. *If* $\mu<\overline{\mu}_2$ (*region 2*):

(i) $\alpha<\alpha_{T_2}$: $\underline{\sigma_N}<\widetilde{\sigma}_N^U=\widetilde{\sigma}_B^U<\widetilde{\sigma}_{B_2}^{R_2}=\widetilde{\sigma}_{N_2}^{R_2}<\widehat{\sigma}_B^U<min\left[\widehat{\sigma}_{N_2}^{R_2}=\widehat{\sigma}_N^U,\widehat{\sigma}_{B_2}^{R_2}\right]$.

(ii) $\alpha_{T_2}<\alpha<\alpha_{H^U=2}$ (*and* $\alpha_{H^U=2}>0\Leftrightarrow\mu<\mu_H$); *the region 2 thresholds rank as follows:* $\underline{\sigma_N}<\widetilde{\sigma}_N^U=\widetilde{\sigma}_B^U<\widehat{\sigma}_B^U<\widetilde{\sigma}_{B_2}^{R_2}=\widetilde{\sigma}_{N_2}^{R_2}<min\left[\widehat{\sigma}_{N_2}^{R_2}=\widehat{\sigma}_N^U,\widehat{\sigma}_{B_2}^{R_2}\right]$.

(iii) For $\alpha>\alpha_{H^U=2}$: $\widehat{\sigma}_B^U<\underline{\sigma_N}<\widetilde{\sigma}_{B2}^{R_2}=\widetilde{\sigma}_{N_2}^{R_2}<min\left[\widehat{\sigma}_{N_2}^{R_2}=\widehat{\sigma}_N^U,\widehat{\sigma}_{B_2}^{R_2}\right]$.

4. *If* $\mu>\overline{\mu}_2$ (*region 2*), *we always have* $H^U>2$, *since* $\alpha_{H^U=2}<0$. *Then, for all* α: $\widehat{\sigma}_B^U<\widehat{\sigma}_{B_2}^{R_2}<\underline{\sigma_N}<\widehat{\sigma}_{N_2}^{R_2}=\widehat{\sigma}_N^U$.

Proof. The ordering of the thresholds is based on Lemmas 2 and 3.

B.2 Same dominant group at the state and regional level

B.2.1 Bourgeois always dominant. Lemma 5 presents thresholds useful for the proof of Proposition 2.

Lemma 5. *Let*

$$\sigma_{\text{copay\_}B_i}\equiv\frac{2(B_i-B_{-i})+(1-\beta)((B_i-B_{-i})N-2\alpha B_iB)}{(1-\beta)(2\mu\alpha B_iB+N(B_i-B_{-i}))}$$

$$\sigma_{\text{full\_}B_i}\equiv\frac{(B_i-B_{-i})-(1-\beta)\alpha BB_i}{(1-\beta)\mu\alpha BB_i}$$

and

$$\widehat{\alpha_{\text{full}\,i}}=\frac{B_i-B_{-i}}{(1-\beta)BB_i(\mu+1)}\tag{9}$$

Then:

(i) $\sigma_{\text{copay\_}B_1}>\underline{\sigma}_N\Leftrightarrow\sigma_{\text{full\_}B_1}>\underline{\sigma_N}\Leftrightarrow\alpha<\widehat{\alpha_{\text{full}_1}}$.

(ii) $\widehat{\alpha_{\text{full}_1}}>\overline{\alpha}\Leftrightarrow\widehat{\alpha_{\text{full}_1}}<\alpha_{H^U=2}\Leftrightarrow\widehat{\alpha_{\text{full}_1}}>\alpha_{T_1}\Leftrightarrow\mu<\overline{\mu}\Leftrightarrow H^{R_1}<2$.

(iii) $\sigma_{\text{full\_}B_1}>\widehat{\sigma}_{B_1}^{R_1}\Leftrightarrow\alpha<\overline{\alpha}\Leftrightarrow\widehat{\sigma}_{B_1}^{R_1}<\widehat{\sigma}_B^U$.

(iv) $\sigma_{\text{full\_}B_1}>\widehat{\sigma}_B^U\Leftrightarrow\alpha<\overline{\alpha}$.

(v) $\sigma_{\text{copay\_}B_1}\leq\widehat{\sigma}_{N_i}^{R_i}=\widehat{\sigma}_N^R$ *with equality when* $\alpha=0$.

(vi) $\sigma_{\text{copay\_B}_1}>\widetilde{\sigma}_B^U\Leftrightarrow\alpha<\underline{\alpha}$.

(vii) $\sigma_{\text{copay\_}B_1}>\widetilde{\sigma}_{B_1}^{R_1}\Leftrightarrow\alpha<\underline{\alpha}$.

Complete statement of Proposition 2. *A regionally and statewide dominant bourgeoisie always prefers U to R_2. For $\alpha>\underline{\alpha}$, if $\mu<\overline{\mu_1}$, and for $\alpha>\overline{\alpha}$, if $\mu>\overline{\mu_1}$, it strictly prefers U to R_1 or is indifferent between the two systems. For low-enough market integration we have that*:

(i) *For $\alpha<\underline{\alpha}$, if $\mu<\overline{\mu_1}$, it prefers U for $\sigma>\sigma_{\text{copay\_}B_1}$ and R_1 for $\widetilde{\sigma}^{R_1}<\sigma<\sigma_{\text{copay\_}B_1}$.*

(ii) *For $\alpha<\widehat{\alpha_{\text{full}_1}}$ and $\mu>\overline{\mu_1}$, U is preferred for $\sigma>\sigma_{\text{copay\_}B_1}$ and R_1 for $\widehat{\sigma}^{R_1}_{B_1}<\sigma<\sigma_{\text{copay\_}B_1}$.*

(iii) *If $\widehat{\alpha_{\text{full}_1}}<\alpha<\overline{\alpha}$ and $\mu>\overline{\mu_1}$, U is preferred for $\sigma>\sigma_{\text{full\_}B_1}$ and R_1 for $\widehat{\sigma}^{R_1}_{B_1}<\sigma<\sigma_{\text{full\_}B_1}$.*

Proof. R_2 can never be implemented before U. When both are implemented: with full payment under both, $\sigma_{\text{full\_}B_2}<0$ always, so it is never a relevant cutoff. With co-payment under both, $\sigma_{\text{copay\_}B_2}$ is never a relevant cutoff, since R_2 is preferred for $\sigma<\sigma_{\text{copay\_}B_2}<0$ when $\alpha>\alpha_{r_2\text{\_copay}}\equiv N(B_1-B_2)/2\mu B_2 B$ and for $\sigma>\sigma_{\text{copay\_}B_2}>\widehat{\sigma^N}$ when $\alpha<\alpha_{r_2\text{\_copay}}$. For the rest of the proposition: using Lemma 4, the following payment configurations simultaneously arise:

1. For $\sigma>\widehat{\sigma}^{R_1}_{N_1}=\widehat{\sigma}^{U}_{N}$, the bourgeoisie gets schooling for free under both systems. Imposing $I^U_B=I^{R_1}_{B_1}=0$ in equation (7), R_1 is never preferred (indifference for $\alpha=0$). This area arises for all possible values of α and μ, and corresponds to subcases 1 and 2 of Lemma 4 for, respectively, $\mu<\overline{\mu_1}$ and $\mu>\overline{\mu_1}$.
2. Co-payment under both systems ($\widetilde{I^U_B}$ and $\widetilde{I^{R_1}_{B_i}}$) arises for $\max(\widetilde{\sigma}^U,\widetilde{\sigma}^{R_1})<\sigma<\widehat{\sigma}^U_N$ for $\mu<\overline{\mu_1}$ (case 1 in Lemma 4) and for $\max(\widetilde{\sigma}^U,\underline{\sigma_N})<\sigma<\widehat{\sigma}^U_N$ for $\mu>\overline{\mu_1}$. (case 2). From equation (7), U is preferred when $\sigma>\sigma_{\text{copay\_}B_1}$. Consider first $\mu<\overline{\mu_1}$: as from item (vii) in Lemma 5 we have that if $\alpha=\underline{\alpha}$ then $\widetilde{\sigma}^{R_1}=\sigma_{\text{copay\_}B_1}$, for all $\alpha>\underline{\alpha}$ we have that $\sigma>\sigma_{\text{copay\_}B_1}$ and thus U is always preferred. By contrast, for $\alpha<\underline{\alpha}$, U is preferred if and only if $\sigma>\sigma_{\text{copay\_}B_1}$. Consider next the case $\mu>\overline{\mu_1}$: as we have that if $\alpha=\widehat{\alpha_{\text{full}_1}}$ then $\underline{\sigma_N}=\sigma_{\text{copay\_}B_1}$, for all $\alpha>\widehat{\alpha_{\text{full}_1}}$ (as defined in equation (9)) in this area, we have that $\sigma>\sigma_{\text{copay\_}B_1}$ (as defined in Lemma 5) and thus U is always preferred. As $\overline{\alpha}>\widehat{\alpha_{\text{full}_1}}$, U is preferred whenever $\alpha>\overline{\alpha}$. By contrast, for $\alpha<\widehat{\alpha_{\text{full}_1}}$, U is preferred if and only if $\sigma>\sigma_{\text{copay\_}B_1}$.
3. Full payment by the bourgeoisie under both systems, arising only for $\mu>\overline{\mu_1}$ for $\max[\widehat{\sigma}^U_B,\widehat{\sigma}^{R_1}_{B_1}]<\sigma<\underline{\sigma_N}$. Using $I^U_B=M/B$ and $I^{R_1}_{B_1}=M/2B_1$ in equation (7), U is preferred if and only if $\sigma>\sigma_{\text{full\_}B_1}$. As $\alpha=\overline{\alpha}$ implies that $\widehat{\sigma}^{R_1}_{B_1}=\sigma_{\text{full\_}B_1}$, for all $\alpha>\overline{\alpha}$, in this area, we have that $\sigma>\sigma_{\text{full\_}B_1}$ and thus U is always preferred. By contrast, for $\alpha<\overline{\alpha}$ in this area, R_1 is preferred as $\sigma<\sigma_{\text{full\_}B_1}$.
4. Only U is possible, so U is preferred. For $\mu<\overline{\mu_1}$, this arises for $\max(\widetilde{\sigma}^U,\underline{\sigma_N})<\sigma<\widetilde{\sigma}^R$ for $\alpha>\underline{\alpha}$ (part funding) and for $\widehat{\sigma}^U_B<\sigma<\underline{\sigma_N}$

(corresponding to $\alpha > \alpha_{H^U=2}$, full funding) and for $\mu > \overline{\mu_1}$, this arises for $\sigma_{\text{full\_}B_1} < \sigma < \widehat{\sigma}_{B_1}^{R_1}$ (corresponding to $\alpha > \overline{\alpha}$, with full funding).

5. Only R_1 is possible, so R_1 is preferred. For $\mu < \overline{\mu_1}$, this arises for $\widetilde{\sigma}_{B_1}^{R_1} < \sigma < \widetilde{\sigma}^U$ (for $\alpha < \underline{\alpha}$, part funding). For $\mu > \overline{\mu_1}$, this arises for $\underline{\sigma_N} < \sigma < \widetilde{\sigma}^U$ (for $\alpha < \alpha_{H^U=2}$, part funding) and for $\widehat{\sigma}_{B_1}^{R_1} < \sigma < \min(\widetilde{\sigma}^U, \underline{\sigma_N})$ (arising for $\alpha < \overline{\alpha}$, full funding).

Proposition 7. *Dominated landowners are indifferent between R_1 and U unless only one system is implementable and fully financed by the dominant bourgeoisie, in which case they prefer no education. If R_1 is the only implementable system, region-2 bourgeoisie does not oppose it. Instead, if U is also feasible, region-2 bourgeoisie prefers U and a conflict arises.*

Proof. Landowners preferring schooling to no schooling select the cheaper system. However, whenever schooling is implemented for $\sigma < \underline{\sigma_N}$ and fully financed by the dominant bourgeoisie, dominated landowners are made worse off than under no schooling. Under co-payment, the landowners are made indifferent to no schooling. As the landowners' cutoffs for full financing of education and the associated education costs ($I_{N_1}^{R_1} = I_N^U = \frac{M}{N}$) are the same under R_1 and U, landowners are in that case indifferent between the two systems. Region-2 bourgeoisie: if only R_1 is feasible, their outcome is still the no-education payoff. Instead, if U is feasible, this means it is preferred to no schooling, so implementing R_1 leaves them worse off.

B.2.2 Landowners are always dominant

The following Lemma presents results useful for Proposition 3.

Lemma 6. *Let*

$$\sigma_{\text{copay\_}N_i} = \frac{2B_i - (1-\alpha)B}{\mu(2B_i - (1+\alpha)B)}$$

$$\alpha_{\text{turn}_i} = \frac{B_i - B_{-i}}{B}$$

and

$$\mu_x = \frac{N + (1-\beta)NB_2}{(1-\beta)B_1(N + 2(B_1 - B_2))}$$

Then:

(i) $\alpha_{\text{turn}_1} > \overline{\alpha}$ *always*.

(ii) $\sigma_{\text{copay\_}N_1} > \widetilde{\sigma}^{R_1} \Leftrightarrow \alpha < \underline{\alpha}$ *for* $\alpha > \alpha_{\text{turn}_1}$ *and* $\sigma_{\text{copay\_}N_1} > \widetilde{\sigma}^{R_1} \Leftrightarrow \alpha > \underline{\alpha}$ *for* $\alpha < \alpha_{\text{turn}_1}$.

(iii) $\sigma_{\text{copay\_}N_1} < \widehat{\sigma}_{B_1}^{R_1} \Leftrightarrow \sigma_{\text{copay\_}N_1} < \widehat{\sigma}_B^U \Leftrightarrow \alpha < \overline{\alpha}$ for $\alpha < \alpha_{\text{turn}_1}$ *and* $\sigma_{\text{copay\_}N_1} < \widehat{\sigma}_{B_1}^{R_1} \Leftrightarrow \sigma_{\text{copay\_}N_1} < \widehat{\sigma}_B^U \Leftrightarrow \alpha > \overline{\alpha}$ *for* $\alpha > \alpha_{\text{turn}_1}$.

(iv) $\sigma_{\text{copay\_}N_1} > \widetilde{\sigma}^U \Leftrightarrow \alpha > \underline{\alpha}$ *for* $\alpha < \alpha_{\text{turn}_1}$.

(v) $\alpha_{\text{turn}_i} < \alpha_{T_i} \Leftrightarrow \mu < \mu_x$.
(vi) $\mu_x < \overline{\mu}_1$ *always*.

Proof. By simple algebra.
Proof of Proposition 3. As from Lemma 6 $\alpha_{\text{turn}_2} < 0$, $\alpha > \alpha_{\text{turn}_2}$ always holds and R_2 is preferred for $\sigma < \sigma_{\text{copay\_}N_2}$. However, this cutoff is never relevant as it reaches its maximum for $\alpha = 0$, namely $\sigma_{\text{copay\_}N_2}(\alpha = 0) = 1/\mu = \underline{\mu}_{B_2}^{R_2}$ and region-2 landowners always prefer U. Rest of the proof: independently on α and μ, for $\sigma > \max[\widehat{\sigma}_{B_i}^{R_i}, \widehat{\sigma}_B^U]$, $I_{N_1}^{R_1} = I_N^U = 0$, and thus landowners are indifferent. For $\overline{\alpha} < \alpha < \alpha_{T_1}$ and $\mu < \overline{\mu_1}$ (Lemma 4(1.iv)), the three remaining possibilities are:

(i) For $\widehat{\sigma}_B^U < \sigma < \widehat{\sigma}_{B_1}^{R_1}$, $I_N^U = 0$ and $\widetilde{I_{N_1}^{R_1}} > 0$ and thus U is preferred.
(ii) For $\widetilde{\sigma}^{R_1} < \sigma < \widehat{\sigma}_B^U$, there is co-payment under both systems, and U is preferred if and only if $I_{N_1}^{R_1} > \widetilde{I_N^U}$, which holds if $\sigma > \sigma_{\text{copay\_}N_1}$ for $\alpha > \alpha_{\text{turn}_1}$ and $\sigma < \sigma_{\text{copay\_}N_1}$ for $\alpha < \alpha_{\text{turn}_1}$. From Lemma 6(vi), $\mu_x < \overline{\mu}_1$ always holds, so either $\mu < \mu_x < \overline{\mu}$ or $\mu_x < \mu < \overline{\mu_1}$.
   (iia) If $\mu < \mu_x < \overline{\mu}$. If $\mu < \mu_x$, then from Lemma 6(v), $\alpha_{\text{turn}_i} < \alpha_{T_i}$ and we need to distinguish $\overline{\alpha} < \alpha < \alpha_{\text{turn}_i}$ from $\alpha_{\text{turn}_i} < \alpha < \alpha_{T_i}$. If $\alpha < \alpha_{\text{turn}_1}$, given that from Lemma 6(iii) $\sigma_{\text{copay\_}N_1} > \widehat{\sigma}_B^U$ when $\alpha > \overline{\alpha}$ for $\alpha < \alpha_{\text{turn}_1}$, the cutoff is never relevant and U is always preferred. When $\alpha_{\text{turn}_i} < \alpha < \alpha_{T_i}$ for $\mu < \mu_x$, then we need to examine $\sigma < \sigma_{\text{copay\_}N_1}$ but from Lemma 6(iii) $\sigma_{\text{copay\_}N_1} < \widehat{\sigma}_B^U$ and $\sigma_{\text{copay\_}N_1} < \widetilde{\sigma}^{R_1} \Leftrightarrow \alpha > \underline{\alpha}$ for $\alpha > \alpha_{\text{turn}_1}$, so it is never relevant and U is always preferred.
   (iib) If instead $\mu_x < \mu < \overline{\mu_1}$, we have $\alpha_{\text{turn}_i} > \alpha_{T_1}$ by Lemma 6(v) and we are always in the area $\alpha < \alpha_{\text{turn}_i}$, and thus U is always preferred, as shown.
(iii) For $\widetilde{\sigma}^U < \sigma < \widetilde{\sigma}^{R_1}$, U is the only viable system, and thus is preferred. For $\overline{\alpha} < \alpha_{T_1} < \alpha$ and $\mu < \overline{\mu_1}$ (Lemma 4(1v)) and for $\overline{\alpha} < \alpha_{H^U=2} < \alpha$ and $\mu < \overline{\mu_1}$ (Lemma 4(1vi)), we get only a subset of the cases for $\overline{\alpha} < \alpha < \alpha_{T_1}$, and thus U is always preferred. For $\alpha < \overline{\alpha}$ and $\mu < \overline{\mu_1}$ (Lemma 4(1ii) to (1iv)), co-payment under both systems is again possible. From Lemma 6(i) $\alpha_{\text{turn}_1} > \overline{\alpha}$; hence, we are in the area of $\alpha < \alpha_{\text{turn}_1}$, and we need to examine the area for which $\sigma > \sigma_{\text{copay\_}N_1}$. By Lemma 6(iv), $\sigma_{\text{copay\_}N_1} < \widetilde{\sigma}^U \Leftrightarrow \alpha < \underline{\alpha}$, and given that $\alpha < \underline{\alpha}$ holds for region (1ii) in Lemma 4, R_i is always preferred under co-payment in both systems if $\alpha < \underline{\alpha}$. Under ranking 1(iii) $\alpha > \underline{\alpha}$, so given that $\sigma_{\text{copay\_}N_1} > \widetilde{\sigma}^{R_1} \Leftrightarrow \alpha > \underline{\alpha}$ for $\alpha < \alpha_{\text{turn}_1}$, the cutoff can only be relevant if $\sigma_{\text{copay\_}N_1} < \widehat{\sigma}_{B_1}^{R_1}$, which by Lemma 6(iii) holds for $\alpha < \overline{\alpha}$ when $\alpha < \alpha_{\text{turn}_1}$. So U is preferred under co-payment for $\widetilde{\sigma}^{R_1} < \sigma < \sigma_{\text{copay\_}N_1}$, while R_1 is preferred for $\sigma_{\text{copay\_}N_1} < \sigma < \widehat{\sigma}_{B_1}^{R_1}$. In addition, for $\widetilde{\sigma}^{R_1} < \sigma < \widetilde{\sigma}^U$ (arising for $\alpha < \underline{\alpha}$) R_1 is the only viable system, and thus preferred. For $\mu > \overline{\mu_1}$, no ranking with co-payment under both systems exists; thus, landowners are either indifferent or prefer R_1, as it is the only viable system (for $\underline{\sigma}_N < \sigma < \widetilde{\sigma}^U$) or given that $I_{N_1}^{R_1} = 0$ and $\widetilde{I_N^U} > 0$ simultaneously hold (for $\widetilde{\sigma}^U < \sigma < \widehat{\sigma}_B^U$).

Proposition 8. *For $\alpha>\overline{\alpha}$, if $\mu<\overline{\mu_1}$, and for $\alpha>\alpha_{H^U=2}$, if $\mu>\overline{\mu_1}$, region-1's bourgeoisie prefers to be dominated under U or is indifferent between the two systems. In the other cases, region-1's bourgeoisie prefers R_1 for $\max[\underline{\sigma}_N, \widehat{\sigma}_{B_1}^{R_1}]<\sigma<\sigma_{\text{full\_}B_1}$, prefers U for $\sigma>\sigma_{\text{full\_}B_1}$ and is indifferent otherwise. Region-2's dominated bourgeoisie never prefers R_2 while region-2 landowners prefer U over R_1 when both systems are feasible.*

Proof. The dominated bourgeoisie can be in a number of possible situations:

(i) It has to pay its maximal willingness and is thus indifferent with no education, which happens when one or both systems are possible with co-payment.

(ii) It fully pays under one system and pays its maximal willingness under the other system: it then prefers the system it fully finances, since it benefits from education under that system.

(iii) It has to fully pay under both systems; region-2's bourgeoisie always prefers U, as they are made indifferent to no education under R_1. Region-1's bourgeoisie prefers R_1 for $\widehat{\sigma}_B^U<\sigma<\sigma_{\text{full\_}B_1}$ and U for $\sigma>\sigma_{\text{full\_}B_1}$ when (a) $\mu<\overline{\mu_1}$ and $\alpha<\overline{\alpha}$ or (b) $\mu>\overline{\mu_1}$ and $\alpha<\alpha_{H^U=2}$. Region-1's bourgeoisie prefers R_1 for $\underline{\sigma}_N<\sigma<\sigma_{\text{full\_}B_1}$ and U for $\sigma>\sigma_{\text{full\_}B_1}$ when $\mu>\overline{\mu_1}$ and $\alpha_{H^U=2}<\alpha<\overline{\alpha}$. In all other cases, region-1's bourgeoisie always prefers U. These follow directly from point 3 in the proof of Proposition 2 and points (ii), (iii), (iv) and (v) from Lemma 5. With respect to region-2 landowners, if U and R_1 are both feasible, they prefer U as they would get a payoff above no education, which is what happens in their region if R_1 is implemented.

B.3 Regionally dominant but statewide dominated bourgeoisie

Lemma 7

1. *For $I_B^U = M/B$* and $\widetilde{I}_{B_i}^{R_i}>0$, *a regionally dominant but countrywide dominated bourgeoisie chooses R_i only for $\sigma<\sigma_{aa}$ if $\alpha>\alpha_{\text{flip\_}B_i}$ and for $\sigma>\sigma_{aa}$ if $\alpha<\alpha_{\text{flip\_}B_i}$, where $\alpha_{\text{flip\_}B_i} = N/\mu 2B_i$* and

$$\sigma_{aa} \equiv \frac{2(B_i-B_{-i})-(1-\beta)B(N+2\alpha B_i)}{(1-\beta)(\mu 2\alpha B_i-N)B}$$

2. *For $I_B^U = M/B$ and $I_{B_i}^{R_i} = 0$, the bourgeoisie chooses R_i* for $\sigma<\sigma_a$, *where* $\sigma_a \equiv \frac{2-(1-\beta)\alpha B}{(1-\beta)\mu\alpha B}$

Proof. By substituting the corresponding education costs into equation (7).

Lemma 8

(i) $\sigma_a>\widehat{\sigma}_B^U$ *always.*

(ii) $\sigma_a>\widehat{\sigma}_N \Leftrightarrow \sigma_{aa_i}>\widehat{\sigma}_N \Leftrightarrow \sigma_a<\sigma_{aa_i} \Leftrightarrow \alpha<\alpha_f$ *for* $\alpha>\alpha_{\text{flip\_}B_i}$.

(iii) $\sigma_a>\widehat{\sigma}_N \Leftrightarrow \sigma_{aa_i}<\widehat{\sigma}_N \Leftrightarrow \sigma_a>\sigma_{aa_i} \Leftrightarrow \alpha<\alpha_f$ *for* $\alpha<\alpha_{\text{flip\_}B_i}$.

(iv) $\widetilde{\sigma}^{R_i}>\widehat{\sigma}_B^U \Leftrightarrow \sigma_{aa_i}<\widetilde{\sigma}^{R_i} \Leftrightarrow \sigma_{aa_i}<\widehat{\sigma}_B^U \Leftrightarrow \alpha>\alpha_{T_i}$ *for* $\alpha>\alpha_{\text{flip\_}B_i}$.

(v) $\sigma_{aa_i} > \underline{\sigma_N} \Leftrightarrow \alpha < \widehat{\alpha_{\text{full}_i}}$ *for* $\alpha > \alpha_{\text{flip\_}B_i}$ *and* $\sigma_{aa_i} > \underline{\sigma_N} \Leftrightarrow \alpha > \widehat{\alpha_{\text{full}_i}}$ *for* $\alpha < \alpha_{\text{flip\_}B_i}$.

(vi) $\widetilde{\sigma}^{R_i} < \widehat{\sigma}_B^U \Leftrightarrow \sigma_{aa_i} < \widetilde{\sigma}^{R_i} \Leftrightarrow \sigma_{aa_i} < \widehat{\sigma}_B^U \Leftrightarrow \alpha < \alpha_{T_i}$ *for* $\alpha < \alpha_{\text{flip\_}B_i}$.

(vii) *If* $\min[\widehat{\sigma}_{N_i}^{R_i}, \widehat{\sigma}_B^U] = \widehat{\sigma}_{N_i}^{R_i}$ (i.e., *when* $\alpha < \alpha_r$) *then* $\sigma_a > \max[\widehat{\sigma}_{N_i}^{R_i}, \widehat{\sigma}_B^U] = \widehat{\sigma}_B^U$.

(viii) $a_{T_2} < \alpha_f < \alpha_{\text{flip\_}B_2}$ *always.*

(ix) $\widehat{\alpha_{\text{full}_i}} < \alpha_f \Leftrightarrow \alpha_f < \alpha_{\text{flip}_i}$.

(x) $\widehat{\alpha_{\text{full}_i}} > \alpha_{H^U=2} \Leftrightarrow \mu > \overline{\mu} \Leftrightarrow H^{R_i} > 2$.

(xi) $\widehat{\alpha_{\text{full}_1}} > \overline{\alpha} \Leftrightarrow \mu < \overline{\mu} \Leftrightarrow H^{R_1} < 2$, where α_{T_i} is defined in Lemma 2, $\widehat{\alpha_{\text{full}_i}}$ is given by equation (9) and

$$\alpha_f = \frac{2N}{B(2\mu + (1-\beta)N(\mu+1))}$$

Proof. Points (i) to (vi) and (viii) to (xi) by simple algebra. Point (vii) follows from point (i).

Lemma 9. *For* σ *sufficiently large,* $I_B^U = M/B$ *and* $I_{B_i}^{R_i} = 0$ *always hold. If, for smaller values of* σ*, a payment region* $I_B^U = M/B$ *and* $I_{B_i}^{R_i} = \widetilde{I_{B_i}^{R_i}}$ *exists, then the cutoff* σ_a *is only relevant when* R_i *is preferred for the larger values of* σ *within that region.*

Proof. The payment region $I_B^U = M/B$ and $I_{B_i}^{R_i} = 0$ requires that $\sigma > \max[\widehat{\sigma}_B^U, \widehat{\sigma}_N]$. In turn, the region $I_B^U = M/B$ and $I_{B_i}^{R_i} = \widetilde{I_{B_i}^{R_i}}$ only exists for parameter constellations with $\widehat{\sigma}_B^U < \widehat{\sigma}_N$. For σ_a to be a relevant cutoff, we need $\sigma_a > \widehat{\sigma}_N$. For $\alpha > \alpha_{\text{flip\_}B_i}$ by point (ii) of Lemma 8, $\sigma_a > \widehat{\sigma}_N \Leftrightarrow \sigma_{aa_i} > \widehat{\sigma}_N \Leftrightarrow \sigma_a < \sigma_{aa_i} \Leftrightarrow \alpha < \alpha_f$; hence, whenever the cutoff σ_a is relevant, R_i is preferred in the entire region $I_B^U = M/B$ and $I_{B_i}^{R_i} = \widetilde{I_{B_i}^{R_i}}$, since R_i is preferred in this payment region for $\sigma < \sigma_{aa_i}$ and $\sigma_{aa_i} > \widehat{\sigma}_N$ lies outside this region's upper bound. In turn, for $\alpha < \alpha_{\text{flip\_}B_i}$, by point (ii) of Lemma 8, $\sigma_a > \widehat{\sigma}_N \Leftrightarrow \sigma_{aa_i} < \widehat{\sigma}_N \Leftrightarrow \sigma_a > \sigma_{aa_i} \Leftrightarrow \alpha < \alpha_f$; hence, whenever the cutoff σ_a is relevant, R_i is preferred for at least the largest values of σ within the region $I_B^U = M/B$ and $I_{B_i}^{R_i} = \widetilde{I_{B_i}^{R_i}}$, given that R_i is preferred in this region for $\sigma > \sigma_{aa_i}$, $\sigma_{aa_i} < \widehat{\sigma}_N$ holds and $\widehat{\sigma}_N$ is the upper bound of this region.

Sketch of Proof of Proposition 4

1. When only R_1 with $(\widetilde{I_B^{R_1}}, \overline{I_N^{R_1}})$ is possible, region-1's bourgeoisie prefers R_1 to no education.
2. Both systems are possible with $(\overline{I_B^U}, \widetilde{I_N^U})$ and $(\widetilde{I_{B_i}^{R_i}}, \overline{I_{N_i}^{R_i}})$: bourgeois prefer R_i, as they are made indifferent to no education under U.
3. Both systems are possible with $(I_B^U = M/B, I_N^U = 0)$ and $(\widetilde{I_{B_i}^{R_i}}, \overline{I_{N_i}^{R_i}})$. Part 1 of Lemma 7 applies and Lemma 8 helps us to establish when the cutoffs are relevant.
4. Both systems are possible, with $(\overline{I_B^U}, \widetilde{I_N^U})$ and $(I_{B_i}^{R_i} = 0, I_{N_i}^{R_i} = M/N)$. They prefer R_i, as they are made indifferent to no education under U.
5. Both systems are possible, with $(I_B^U = M/B, I_N^U = 0)$ and $(I_{B_i}^{R_i} = 0, I_{N_i}^{R_i} = M/N)$. By part 2 of Lemma 7, they prefer R_i for $\sigma < \sigma_a$. For

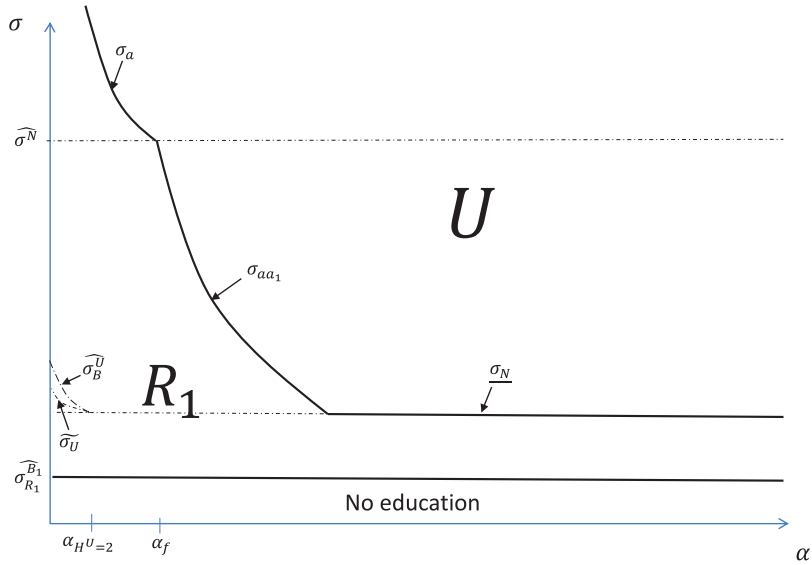

Figure 10. Region-1-dominant but statewide dominated bourgeois ($\mu > \overline{\mu_1}$).

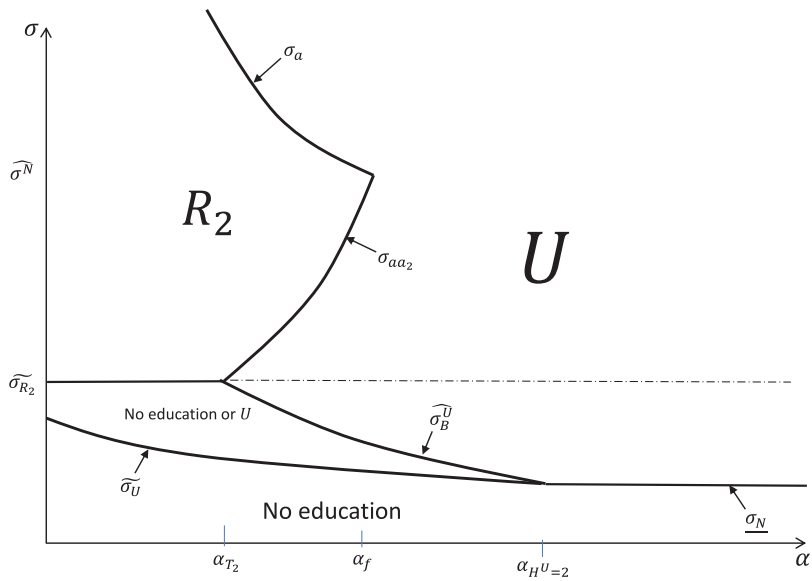

Figure 11. Region-2-dominant but statewide dominated bourgeois ($\mu < \overline{\mu_2}$).

$\sigma > \max[\widehat{\sigma_B^U}, \widehat{\sigma_{N_1}^{R_1}}] = \widehat{\sigma_B^U}$, the cutoff is always relevant. For $\sigma > \max[\widehat{\sigma_B^U}, \widehat{\sigma_{N_1}^{R_1}}] = \widehat{\sigma_{N_1}^{R_1}}$, by Lemma 9, the cutoff is only relevant when R_i is preferred, at least in the high σ part of the payment region, where $I_B^U = M/B$ and $I_{B_i}^{R_i} = \widetilde{I_{B_i}^{R_i}}$.

6. Only U is possible with $(\overline{I_B^U}, \widetilde{I_N^U})$. They are indifferent between U and no education.
7. Only R_i is possible, with $(I_{B_i}^{R_i} = M/2B_i, I_{N_i}^{R_i} = 0)$. Bourgeois prefer R_i, as better off than under no education.
8. Only U is possible, with $(I_B^U = M/B, I_N^U = 0)$. They prefer U, as they are better off than under no education.

Figures 10 (resp. Figure 11) represents the choice of education system by a region-1 (resp. region-2) dominant bourgeoisie for $\mu > \bar{\mu}_1$ (resp. $\mu < \bar{\mu}_2$). The full proof of Proposition 4 is presented in the online appendix and uses Lemmas 7, 8 and 9. Proposition 9 characterizes landowners' preferences.

Proposition 9. *Regionally dominated but statewide dominant landowners oppose R_i or are indifferent between R_i and U.*

Proof. The different subcases correspond to the sketch of the proof of Proposition 4.

1. Landowners are indifferent, as they pay their maximal willingness.
2. They co-pay under U and pay their maximal willingness under R_i, so they prefer U always ($\sigma > \widetilde{\sigma}_U$).
3. They prefer U (no payment versus indifference, with no education under R_i).
4. $I_{N_i}^{R_i} < \widetilde{I_N^U}$ whenever $\sigma < \sigma_{xx} = (1-\alpha)/\mu(1+\alpha)$. As σ_{xx} monotonically decreases in α, σ_{xx} reaches its maximum $1/\mu$ for $\alpha = 0$. Then, as $\sigma_{N_1}^{R_1} > 1/\mu$, they never prefer R_i here.
5. They fully pay R_i but get U for free, so they prefer U.
6. They prefer U, as they end up being better off than under no education.
7. They oppose R_i, as they are made worse off than under no education.
8. They prefer U, as they get education for free.

B.4 Regionally dominant but statewide dominated landowners

Proof of Proposition 5. Regionally dominant but statewide dominated landowners prefer R_i to U whenever R_i is cheaper and both types of schooling are implementable. When only R_i is implementable, they always prefer R_i. When only U is implementable, we need to check whether or not they are better off than under no schooling. Specifically, the following payment constellations can arise:

1. Only R_1 is possible with payments $(\overline{I_{B_1}^{R_1}}, \widetilde{I_{N_1}^{R_1}})$: R_1 is preferred because they are better off than under no schooling.

2. R_i and U are possible, with $(\overline{I_{B_i}^{R_i}}, \widetilde{I_{N_i}^{R_i}})$ for $\widetilde{\sigma}_{R_i} < \sigma < \widehat{\sigma}_{B_i}^{R_i}$ and $(\widetilde{I_B^U}, \overline{I_N^U})$ for $\max[\widetilde{\sigma}_U, \widetilde{\sigma}_{R_i}] < \sigma < \widehat{\sigma}_N^U$. Region-$i$ landowners prefer R_i, as they are made indifferent under U.
3. R_i and U are possible, with $(I_{B_i}^{R_i} = M/2B_i, I_{N_i}^{R_i} = 0)$ for $\sigma > \widehat{\sigma}_{B_i}^{R_i}$ and $\left(\widetilde{I_B^U} = \frac{2-N(1-\beta)(\sigma-1)}{2B}M, \quad \overline{I_N^U}\right)$ for $\widetilde{\sigma}_U < \sigma < \widehat{\sigma}_N^U$: landowners prefer R_i, since U leaves them no better off than no education.
4. Both systems are possible, with $(\overline{I_{B_i}^{R_i}}, \widetilde{I_{N_i}^{R_i}})$ for $\widetilde{\sigma}_{R_i} < \sigma < \widehat{\sigma}_{B_i}^{R_i}$ and $(I_{B_i}^U = 0, I_N^U = M/N)$ for $\sigma > \widehat{\sigma}_N^U$). Landowners prefer R_i for $\sigma > 1/\mu$, which always holds.
5. R_i and U are possible, with $(I_{B_i}^{R_i} = M/2B_i, I_{N_i}^{R_i} = 0)$ for $\sigma > \widehat{\sigma}_{B_i}^{R_i}$ and $(I_{B_i}^U = 0, I_N^U = M/N)$ for $\sigma > \widehat{\sigma}_N^U$: landowners prefer R_i, as better off than under no education.
6. Only U is possible, with $(\widetilde{I_B^U}, \overline{I_N^U})$: the landowners are indifferent between U and no education.
7. Only U is possible with $(I_B^U = M/B, I_{N_i}^{R_i} = 0)$ Landowners oppose U, since they are worse off than under no education.

Proof of Proposition 6. We study in turn the outcomes of the bourgeoisie for the regions identified in the proof of Proposition 5:

1. Only R_1 is possible: region-1 bourgeois made indifferent to no education.
2. The bourgeoisie prefers U, as they are made indifferent under R_i.
3. As the bourgeoisie prefers R_i to U if and only if $I_B^U - I_{B_i}^{R_i} \geqslant (1-\beta)(1+\mu\sigma)\frac{M}{2}\alpha$ this payment constellation leads to the bourgeoisie preferring R_i for $\sigma < \sigma_{y_i} \equiv \frac{(B_i - B_{-i}) + (1-\beta)B_i(N-\alpha B)}{(1-\beta)B_i(\mu\alpha B + N)}$ Now, this cutoff is only relevant if $\sigma_{y_i} > \max[\widehat{\sigma}_{B_i}^{R_i}, \underline{\sigma_N}]$ and if $\sigma_{y_i} > \widetilde{\sigma}_U$. Simple algebra yields $\sigma_{y_i} > \widehat{\sigma}_{B_i}^{R_i} \Leftrightarrow \alpha < \alpha_{s_i} \Leftrightarrow \sigma_{y_i} > \widetilde{\sigma}_U$ (where α_{s_i} is defined in Lemma 2). For region 1(i) in Lemma 4, there is thus no conflict of interest for $\max[\widehat{\sigma}_{B_i}^{R_i}, \widetilde{\sigma}_U] < \sigma < \min[\widehat{\sigma}_N^U, \sigma_{y_i}]$, but there is instead one for $\min[\widehat{\sigma}_N^U, \sigma_{y_i}] < \sigma < \widehat{\sigma}_N^U$. In regions 1(ii) to 1(vi), there is always a conflict of interest, since $\alpha > \alpha_{s_i}$. For region-2 schooling, there is always a conflict of interest when $\mu < \overline{\mu_2}$ (ranking 3(i,ii,iii) since $\alpha_{s_2} < \overline{\alpha_2} < 0$; hence, there are no $\alpha < \alpha_{s_2}$). For $\mu > \overline{\mu_i}$ (cases 2 and 4 in Lemma 4), $\max[\widehat{\sigma}_{B_i}^{R_i}, \underline{\sigma_N}] = \underline{\sigma_N}$ and simple algebra yields $\sigma_{y_i} > \underline{\sigma_N}$ when $\alpha < \widehat{\alpha_{\text{full}_i}}$, defined by equation (9), which never holds for $i = 2$. So under cutoff ranking 4, there is always a conflict of interest. Now, for region 1 for $\alpha < \widehat{\alpha_{\text{full}_1}}$ we get no conflict of

interest for $\underline{\sigma_N} < \sigma < \min[\widehat{\sigma}_N^U, \sigma_{y_i}]$, but a conflict for $\min[\widehat{\sigma}_N^U, \sigma_{y_i}] < \sigma < \min \widehat{\sigma}_N^U$ and also for $\alpha > \widehat{\alpha_{\text{full}_1}}$.

4. and 5. The bourgeois prefer U as they get education for free.

6. and 7. Only U is possible: the bourgeois prefer U, as the outcome is better than no education.

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