Group Ties amid Industrial Change: Historical Evidence from the Fossil Fuel Industry

Noah Zucker
Columbia University
noah.zucker@columbia.edu

August 2021

Coethnics often work in the same industries. How does this ethnic clustering affect individuals' political loyalties amid industrial growth and decline? Focusing on migrant groups, I contend that ethnic groups' distribution across industries alters their cohesiveness and the allegiances of their members. When a group is concentrated in a growing industry, economic optimism and resources flow between coethnics, bolstering migrants' confidence in their economic security and dissuading investments in political assimilation. When a group is concentrated in a declining industry, these gains dissipate, leading migrants to integrate into outside groups with greater access to political rents. Analyses of immigrants near U.S. coal mines in the early 20th century support this theory. This work shows how ethnic groups' distribution across industries shapes the evolution of identity cleavages and illuminates how decarbonizing transitions away from fossil fuels may redraw group boundaries and identity conflicts.

Keywords: fossil fuels, identity, industry, migration
Word count: 11,640

Members of the same ethnic group often work in some industries more than others. Marginalized groups contend with labor market discrimination that pushes them to industries subject to less bias or with jobs less desirable to dominant groups.[1] Referral networks often lead individuals to join industries employing large numbers of coethnics.[2] Groups may have cultural or social characteristics that render them likelier to seek and secure employment in certain industries.[3] This ethnic segmentation of labor markets can emerge out of stark intergroup divisions. Could ethnic groups' varied exposure to given industries also transform those identity cleavages?

An emergent literature links industrial decline to an accentuation of social divisions, an aggravation of ethnic grievances and polarization of politics along ethnocultural lines.[4] Economic anxieties, which might result from global market volatility and competition or longer-term processes of deindustrialization, have been associated with growing ethnocentric and right-wing populist movements across Europe and North America.[5] Industrial contractions drive wedges between identity groups, scholars contend, rallying voters behind policies and politicians pledging to guard their group's social and economic standing.

Much of this literature has focused on the behavior of dominant ethnic groups, such as communities of native-born white Americans, who associate industrial decay with a loss of social status and accordingly take steps to protect the status quo group hierarchy.[6] Yet members of lower status, politically excluded groups — such as internal and international migrants — have long concentrated in volatile industries. In the early twentieth century, Southern and Eastern European immigrants filled the workforces of many American industries exposed to global economic flux.[7] Black Americans who moved to northern cities during the Great Migration clustered in jobs subject to uniquely "random" terms of employment.[8] Manufacturers in the United States, the focus of much recent work on industrial decline and white identity, today employ about three million foreign-born workers.[9] Migrants across developed and developing countries are closely connected to industries at risk of decline due to the physical impacts of

[1] Hechter 1974; Osgood and Peters 2017; Gaikwad and Suryanarayan 2019; Brutger and Guisinger 2021.

[2] Hiebert 1993.

[3] Becker and Pascali 2019.

[4] Abou-Chadi and Kurer 2021; Ballard-Rosa et al. 2020; Ballard-Rosa, Jensen, and Scheve 2021.

[5] Rodrik 2018; Ahlquist, Copelovitch, and Walter 2020; Dehdari 2020; Broz, Frieden, and Weymouth 2021.

[6] Gidron and Hall 2017; Jardina 2019. One exception is Baccini and Weymouth 2021, who also study Black voters in the U.S. while describing this as a topic that "has received very little attention" in the academic literature (550).

[7] Cohen 2014.

[8] Wilkerson 2010, 334.

[9] Estimate by author based on 2019 American Community Survey (Ruggles et al. 2021).

climate change and decarbonization.[10]

Here I contend that marginalized groups' distribution across industries has important implications for those groups' cohesiveness and the clarity of intergroup boundaries. When an industry is steadily growing, ethnic groups concentrated in that industry reap the benefits of that growth, distributing positive economic information and material resources among their members. This buttresses group members' sense of economic security and confidence in the ability of their in-group to support their welfare, disincentivizing attempts to secure support from outside sources. When an industry experiences negative shocks, economic anxieties spread through groups concentrated in that industry, eroding confidence in those groups' ability to offset income losses and guard against future economic risks. Whereas members of dominant groups observing economic loss find receptive politicians upon doubling down on their ethnic identity, members of marginalized groups may instead be inclined to assimilate into outside groups offering access to lucrative political benefits previously out of reach. Concentration in declining industries can weaken, not accentuate, status quo group ties.

I apply this argument to the coal industry in the early-twentieth century U.S., an era of stark interethnic division and substantial market volatility. I focus specifically on European immigrants working in and around coal mines, who were situated in dense ethnic enclaves that circulated both information and material resources. Using complete-count U.S. census records linked over time and newly transcribed data on local coal production, I trace how immigrants pursued political assimilation — U.S. citizenship — amid local coal growth and decline. For immigrants in the early-twentieth century U.S., citizenship granted access to the franchise and in turn benefits from politicians and the government.

I find that varied ethnic concentration in the coal industry altered naturalization rates among both immigrants working in coal mines and those employed elsewhere, but in distinct ways according to conditions in local mines. When local production was steadily growing, clear cleavages emerged between immigrant groups: members of groups initially more concentrated in the industry were substantially less likely than others to invest in political assimilation. Yet when negative shocks buffeted local mines, these intergroup differences narrowed, with group concentration in the industry no longer constraining assimilation among immigrant miners or coethnics outside the industry.

These dynamics were most evident for immigrants deeply embedded in their ethnic enclave, underscoring the powerful implications of industrial change for status quo group loyalties. Exploiting variation

[10] See, e.g., *Al Jazeera* 2014, <bit.ly/2StNPRf>; *Reuters* 2019, <reut.rs/2M9Ze2E>.

in mines' political contexts, I also find that these shifts were most pronounced where meaningful political influence was within immigrants' reach. There is little evidence of increased naturalization in areas where access to the franchise would have yielded few benefits, pointing to the political motivations of naturalizing immigrants. Additional tests indicate that these results are not an artifact of immigrants less inclined in assimilate selecting into more productive mining areas.

This paper offers several contributions to scholarship on economic change and identity, particularly to the literature highlighting the malleability of ethnic identifications. While much recent scholarship has focused on the responses of politically privileged groups to industrial decline, this paper shifts attention to disadvantaged groups. In doing so, the paper illuminates how stable growth can deepen existing group allegiances while economic instability disrupts them. While incumbent group ties may shape the initial experience of economic threats,[11] those same ties can be dislodged and transformed as industries contract, eroding the explanatory power of initial social groupings. In making this argument, I contribute to the literature detailing the situational nature and economic sources of social identity.[12] I identify a heretofore underappreciated determinant of identity choice: identity groups' distribution across industries. Social ties not only shape experiences of industrial flux; they themselves can be reconstituted by it.

This paper also adds to our understanding of when migrants forgo investments in political integration. Scholars have identified a rich set of determinants of political assimilation, including mobilization by political elites and the ease of surmounting bureaucratic hurdles.[13] Alongside these factors, the distribution of ethnic groups across industries shapes how migrants perceive their own economic security and invest in attaining greater political voice. Relatedly, this work speaks to the literature on when ethnically diverse migrants politically unify or divide in destination communities. Scholars have found that migrants often unify along class lines at the workplace.[14] This paper underscores the conditional nature of this tendency: in periods of steady growth, immigrants in the same mines varied widely in their propensity to naturalize; it was only amid decline that differences in political engagement across groups evened out.

[11] Mansfield and Mutz 2009; Guisinger 2017; Alt et al. 2021; Baccini and Weymouth 2021.

[12] Patterson 1975; Malkki 1995; Laitin 1998; Brubaker 2002; Posner 2004; Wilkinson 2004; Eifert, Miguel, and Posner 2010.

[13] Dancygier 2017; Gaikwad and Nellis 2021.

[14] Katznelson 1981; Thachil 2017.

Group Ties amid Industrial Growth and Decline

Social identities serve as prisms through which individuals interpret and respond to economic threats. People may hold sociotropic attitudes, for example, that attune them to the welfare of compatriots or coethnics.[15] Yet these identities are pliable, varying in salience by political and economic context.[16] Politicians in competitive electoral settings may instrumentally accentuate ethnic divides.[17] Individuals may associate with high-status groups to compensate for economic losses.[18] While ethnic identities may moderate experiences of economic change, they themselves are subject to change.

In this section, I propose that ethnic groups' distribution across industries — their concentration in certain industries more than others — is an important determinant of their coherence and the allegiances of their members. In contrast to much extant scholarship, I analyze politically marginalized groups, focusing specifically on migrant groups that have long contended with issues of political exclusion.[19] Whereas scholars have argued that economic decline reinforces individuals' ethnic identities, I instead contend that among marginalized groups, ethnic loyalties can be strongest in contexts of consistent economic growth. Group concentration in growing industries affirms ethnic loyalties; concentration in declining industries causes them to break down.

Ethnic Concentration in Industry

Consider a world with two ethnically distinct migrant groups, segregated into separate ethnic enclaves. Social ties among coethnics transmit information on the state of the economy and material resources, as is common among migrant groups.[20] Resource transfers, sustained by high levels of social capital and reciprocity, encompass bilateral extensions of credit and the provision of employment opportunities between coethnics. They also include quasi-institutionalized risk-sharing arrangements, such as mutual aid societies and fraternal insurance associations, that provide an informal safety net for in-group members experiencing losses of income.[21] These groups are politically disenfranchised, lacking the ability to vote or

[15] Mansfield and Mutz 2009; Guisinger 2017; Jardina 2019; Baccini and Weymouth 2021; Suryanarayan and White 2021.
[16] Laitin 1998.
[17] Posner 2004; Wilkinson 2004; Eifert, Miguel, and Posner 2010.
[18] Shayo 2009.
[19] Gaikwad and Nellis 2021.
[20] E.g., Garcia 2005. Ethnic groups may be especially adept at resource sharing due to the ease of sanctioning non-cooperative behavior (Fearon and Laitin 1996).
[21] Scott 1976; Putnam, Leonardi, and Nanetti 1993; Munshi 2014. Resource-sharing technologies are typically built on top of existing social networks and accordingly are often poorly diversified economically (Fafchamps and Gubert 2007).

easily attract economic support from the government, and are differentially distributed across industries in their local economy.

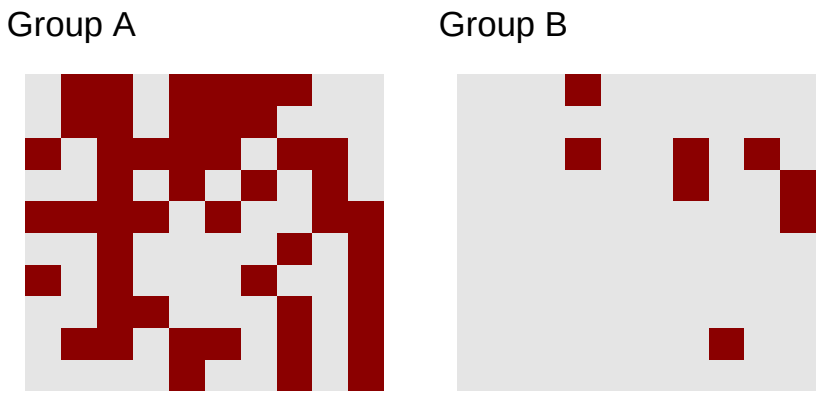

Figure 1: Depictions of two hypothetical ethnic groups (enclaves): a group concentrated in a single industry (Red industry) on the left, a group dispersed across other industries on the right. Cells colored red work in the Red industry; those colored gray work elsewhere.

Figure 1 depicts these two hypothetical groups. In this illustration, each cell represents a worker. Red cells are employed in a single local industry (the "Red industry"), while gray cells work in a mix of other industries. While both groups are the same size, they differ in their concentration in or exposure to the Red industry: half of the workers in Group A are employed in the Red industry, compared to just eight percent in Group B. Because these groups vary in their concentration in the Red industry, they experience the same industrial conditions in distinct ways. I argue that this affects their cohesion and the loyalties of their members.

Ethnic Concentration amid Steady Growth

When the Red industry is steadily growing, workers in that industry receive consistent streams of income. They consequently spread news of good industrial conditions to coethnics in their enclave, transmitting information that highlights their own economic well-being and the health of local labor markets. These industry workers further ably provide material support to coethnic peers as needed and pay into any of the more institutionalized resource-sharing mechanisms their group contains.

While workers belonging to both ethnic groups enjoy such benefits of growth, the extent to which news of their employment and material resources spread to coethnics depends crucially on each group's concentration in the industry. Because Group A is more concentrated in the Red industry than Group

B, members of Group A will on average be more socially proximate to workers in the Red industry, either maintaining direct connections with such workers or being just a couple of degrees removed. All else being equal, members of Group A should accordingly be likelier than members of Group B to receive information and resources from workers in the Red industry. Moreover, because a greater share of Group A is employed in the Red industry, the resource-sharing mechanisms contained by Group A should be enriched to a greater extent than those offered by Group B: Group A's many workers in the Red industry are able to contribute resources to the group, helping offset any idiosyncratic income losses among coethnics.

Because of this varied exposure to workers in the Red industry, differences in the integrity of Group A and Group B should emerge when the Red industry is experiencing steady growth. Individuals who receive optimistic economic information from their peers — information indicating that jobs are plentiful — should become more confident in their own economic standing and less concerned about future labor market risks.[22] Likewise, individuals who receive adequate material support from coethnics or from group-level mechanisms should become more assured of their group's ability to effectively manage economic risks and offset future losses of income. Given that these pieces of information and resources diffuse more widely across Group A, members of Group A should on average be *more confident in their coethnics' ability to support their welfare* than members of Group B. I expect this to be the case for both members of Group A employed in the Red industry and those employed elsewhere: while industry workers send information and resources to peers, they also receive information from coethnic coworkers and become better able to access support in the case of an idiosyncratic shock, bolstering confidence in their ethnic group and attenuating fears of economic risks.[23]

For migrants, this confidence should manifest as less investment in political assimilation and integration. Political assimilation can generate substantial economic benefits, including the ability to attract social services and employment assistance, access to political rents from parties and political elites, and the right to press electorally for expansions of formal welfare programs.[24] However, successfully reaping the benefits of political assimilation — particularly for ostracized ethnic groups — involves surmounting barriers that range from legal obstacles and onerous bureaucratic requirements to a lack of political infor-

[22]Individuals' employment statuses shape their peers' views of the economy and of their own economic security. See, e.g., Alt et al. 2021.

[23]Idiosyncratic shocks being those that occur independently of broad conditions in the industry (e.g., workplace injuries).

[24]Dancygier 2010; Gaikwad and Nellis 2021; Walter 2010.

mation to hostile native populations.[25] Though members of Group A and Group B may equally enjoy the material returns to political assimilation, I expect that migrants in Group A — more confident in their economic security and trusting of the welfare supports furnished by coethnics — will be less willing to invest in achieving those benefits, content to remain reliant on their group for economic protection. Concentration in a growing industry thus deepens group loyalties, buttressing group cohesion.

Ethnic Concentration amid Decline

Suppose that the Red industry is contracting, experiencing either consistent secular decline or intermittent negative shocks ("busts"). Instead of earning steady streams of income, workers in the Red industry now see pay cuts, reductions in working days, or outright job loss. Whereas peers of workers in a growing industry receive positive economic information, acquaintances of workers in an industry undergoing steady decay or contending with negative shocks instead observe job loss and economic pain, accentuating perceptions of economic vulnerability and sowing doubt over their future economic prospects.[26] Workers in the Red industry, rather than ably providing material support to coethnics, now seek out material support from their group to help smooth over income losses.

As in the case of industrial growth, the spread of "pessimistic" information and demands for support depends on each group's concentration in the Red industry. In the group more concentrated in the Red industry, more individuals will observe, either directly or indirectly, coethnics falling on hard times and receive requests for support from coethnics. Resource-sharing systems will similarly be strained in the more exposed group, with decline amounting to a correlated shock to group members.[27] As more members place demands on the group for support, the ability of the group to compensate each member declines, depriving both Red industry workers and their coethnics elsewhere of the ability to offset losses of income. While individuals' first recourse amid an economic shock may be to look to in-group members, group concentration in a declining industry erodes this option. Decline accordingly portends a loss of the "privileges" of concentration in an industry.

I argue above that group concentration in a steadily growing industry suppresses migrants' interest in politically assimilating by bolstering their perceived economic security. This constraining effect should break down amid negative shocks, however, as migrants in more exposed groups become more doubtful

[25] Goodman 2012; Gaikwad and Nellis 2021; Pons and Liegey 2019; Bhavnani and Lacina 2015.
[26] Alt et al. 2021.
[27] Concentration in an industry implies a concentration of risk in that industry.

of their economic security and skeptical of their groups' capacity to effectively ensure their welfare moving forward. While members of groups concentrated in growing industries are content to remain dependent on their coethnics for support, members of groups concentrated in declining industries should instead increasingly look beyond their coethnics for more durable sources of economic support, such as those which accompany political assimilation.

I do not argue that such migrants will necessarily wholly exit their ethnic group, severing ties with coethnics or discarding their group's cultural traditions. Rather, they should seek to *lessen their reliance* on the tenuous resource-sharing mechanisms contained by their group, diversifying the economic backstops to which they have access. Absent an ability to confidently lean on coethnics, migrants concentrated in declining industries should be more willing to bear the costs of political assimilation in pursuit of government support.[28]

It is important to note here a key difference between marginalized groups, such as these hypothetical migrant groups, and politically privileged groups. While issues of concentration in a declining industry may similarly afflict marginalized and advantaged groups, their recourses to government support differ. By virtue of their political privilege, advantaged groups can often find politicians eager to champion their cause in government. Thus, members of privileged groups may find that looking inwards, emphasizing their ethnic identity and "circling the wagons" around their group, is politically profitable in times of economic stress, as recent work on ethnocentric political movements suggests.[29] Members of marginalized groups, which lack equivalent patrons in government, may instead be driven to deemphasize their ethnic identities, loosening ties with coethnics, to achieve greater political sway.

In sum, there is theoretical reason to think that ethnic groups' distribution across industries affects their cohesion and the allegiances of their members, but in ways critically dependent on conditions within those industries. When an industry steadily grows, ethnic groups should vary widely in rates of political assimilation: migrants with greater group exposure to the industry should see less incentive to invest in assimilation, confident in the informal insurance backstops provided by coethnics. When an industry declines, these divergent rates of assimilation should narrow as the gains from concentration in the industry

[28] This is not to say that political assimilation is the only option for lessening reliance on an ethnic group. Migrants may alternatively pursue outmigration or return migration, for example, but migration — itself a risk-laden endeavor Bryan, Chowdhury, and Mobarak 2014 — may not be as appealing a means of mitigating future economic risks. Additionally, dissatisfaction with informal ethnic resource-sharing systems may be "sticky." Migrants may remain wary of relying on coethnics even after finding work outside the area of industrial decline.

[29] Gidron and Hall 2017; Jardina 2019; Baccini and Weymouth 2021.

dissipate.

Hypothesis 1. *Group concentration in an industry should suppress political assimilation in periods of steady growth, but increasingly less so when that industry experiences decline.*

Application to Coal

In the following section, I apply this theory to European immigrants in the early twentieth century U.S., focusing on those proximate to the country's coal industry. This is an appealing test case for several reasons. The many immigrants in and around coal mines lived in dense ethnic enclaves that spread information and resources among coethnics. The coal industry generally grew during this period, but like the modern fossil fuel industry was highly volatile and subject to frequent negative shocks. Moreover, the geography of the coal industry — its sprawl across several states — provides an empirical opportunity: as immigrants' access to political power varied widely across coalfields, I can evaluate how immigrants' behavior differed with the economic returns to political assimilation (access to political rents).

Coal, like any industry, had unique qualities. Yet this case should nonetheless yield generalizable insights into the consequences of ethnic groups' uneven distribution across industries, especially for politically excluded migrants and in settings with weak formal welfare institutions. For example, this case may generalize to manufacturing industries in the early twentieth century U.S., which were similarly encompassed by dense ethnic enclaves,[30] as well as to industries in much of the developing world today, which often feature large numbers of migrant workers and truncated welfare states.[31]

There is also reason to focus specifically on fossil fuel industries. To date, much of the work on economic shocks has focused on manufacturing, particularly in the wake of increased Chinese import competition.[32] Yet fossil fuels have long been marked by pronounced boom-bust cycles and are today under pressure from efforts to arrest the pace of global warming. With contemporary transitions away from fossil fuels emerging as a core political issue, past instances of decline may shed light on how such transitions will proceed in the years ahead.[33] Fossil fuel industries continue to employ large numbers of migrants and members of other marginalized groups, who may shape how the future politics of climate change unfold. While generalizable, there is also value in considering the case of coal for its own sake.[34]

[30] Cohen 2014.
[31] Thachil 2017; Holland 2018.
[32] E.g., Autor, Dorn, and Hanson 2013.
[33] Colgan, Green, and Hale 2021.
[34] Cf. Gailmard 2021.

Case of Coal in the Early Twentieth Century

Coal was the world's primary energy source in the early twentieth century and accordingly one of its most consequential and politically powerful industries.[35] Because mechanization had not yet spread widely, mining was highly labor intensive in these years. In 1920, nearly one million people in the U.S., one percent of the country's total population, reported an occupation in coal mining.[36]

While it was generally a period of growth in the industry, top-line figures mask volatility at the local level, where production varied widely across space and time due to changes in local market conditions, breakdowns in mine infrastructure, and local strike activity — all exacerbated by seasonal cycles in the demand for coal. Because coal was used for most industrial activity and was a popular residential heating fuel, the industry was also susceptible to swings in the national and global economy, which were commonplace at the time. The U.S. economy experienced six contractions between 1900 and 1920;[37] a sharp recession in the early 1920s brought about by the end of World War I and the Spanish Flu pandemic coincided with a 40–50% decline in U.S. coal production.[38] To relieve such pressures, mine operators typically looked to cut labor costs.[39]

The early twentieth century comprised the tail end of the Age of Mass Migration, a period during which thirty million Europeans emigrated to the U.S. and the foreign-born share of the country's population grew to more than 14%. The surge in inward migration was fueled partly by industrial lobbies who sought open immigration policies and actively enticed new arrivals to join their workforces.[40] European immigrants, unlike those from Asia and elsewhere, were largely unencumbered by legal restrictions until the late 1910s and 1920s.[41]

Many immigrants found themselves working in or around coal mines shortly after arriving in eastern port cities. Of the more than 220,000 Southern and Eastern European men who emigrated in 1909, for example, about 8% were working in coal mining by 1910. That year, European immigrants comprised 48% the country's coal mine workforce,[42] helping make the United Mine Workers of America "the most

[35] Mitchell 2011.
[36] U.S. Bureau of the Census 1975.
[37] *NBER* 2020, <bit.ly/3s9IgE8>.
[38] U.S. Bureau of the Census 1975, 358–359.
[39] Andrews 2008.
[40] Peters 2017.
[41] Abramitzky and Boustan 2017.
[42] Author's analysis of complete-count census data (Ruggles et al. 2019).

ethnically and racially diverse union in the U.S. labor movement."[43] In the largest coalfields, immigrant workers often outnumbered native workers by wide margins. In Pennsylvania's Luzerne County, then the largest coal mining county in the country, European immigrants outnumbered native white miners by nearly eight to one; in neighboring Lackawanna County, the ratio was ten to one. Virtually all coal mining counties had some European immigrants present. Accounts from this period suggest that this was not coincidental; many mines featured immigrant bosses who saw coethnics as more reliable and harder working. One miner recalled that bosses in his area preferred Italian workers because they knew they would "produce that coal."[44]

Ethnic compositions of coal mines varied widely, determined largely by the idiosyncratic preferences of local mine operators.[45] Mine operators principally utilized the padrone system to find workers, hiring middlemen — often longer-term immigrants — to entice recent arrivals in cities like New York and Philadelphia to coalfields on the country's interior. Operators placed advertisements in foreign-language newspapers in immigrant-heavy eastern cities as well. The subsequent communication of job opportunities between coethnics further brought new workers to coalfields.[46]

Ethnic Enclaves in Coal Country

Dense ethnic enclaves helped immigrants cope with the economic instability of the time. As in cities, coal towns were marked by high levels of interethnic segregation and animus, with immigrant groups separated from each other and from native citizens socially and spatially; ethnic enclaves were characteristic of coal towns.[47] Yet these communities also featured high levels of within-group solidarity, with mutual aid societies, fraternal insurance associations, and ethnic congregations marking many immigrant enclaves even in more rural areas. Across coalfields, these ethnic organizations were central to life around mines. Such ethnic ties and communications of job openings across them were often what drew immigrants to mines in the first place.[48]

With few formal welfare protections, the informal institutions within ethnic enclaves provided important resource-sharing functions for immigrants in coal communities. Even in contexts of high labor

[43]Trotter 2015, 152.
[44]Delpont 1986.
[45]Shifflett 1991
[46]Cantrell 1988; Fishback 1992.
[47]Cantrell 1988.
[48]Shifflett 1991; Fishback 1992; Beik 2006.

mobility,[49] these mechanisms were a primary means by which immigrants accessed welfare and credit.[50] Immigrants paid monthly dues or made voluntary donations to ethnic organizations, which were then pooled and redistributed to members "in cases of sickness, accidents, or distress" or following deaths of family members.[51] These insurance functions were distinctly important near coal mines, where injuries and deadly accidents were common, especially among immigrants.[52] Coethnics additionally helped to diffuse the costs of production interruptions and wage fluctuations. In Colorado, for example, miners carefully distributed shifts amongst themselves when work opportunities became scarce.[53]

For male European immigrants, there was a persistent option of initiating naturalization proceedings; women were unable to independently naturalize until 1922. After a short period in the U.S., men were permitted to declare their intent to become U.S. citizens in naturalization court ("declarations of intention"). After at least five years in the U.S., they could petition for naturalization — a request typically granted by immigration courts.[54] There was little legal imperative to naturalize beyond its granting of the right to vote; naturalization was an act of political assimilation and means of securing political rents and favorable representation in government. In competitive electoral districts, politicians sometimes actively encouraged immigrants to naturalize and vote.[55] Notably, European immigrants at this time had uniquely pro-welfare preferences,[56] which they were able to act upon electorally once naturalized. My interpretation of naturalization as an indicator of political assimilation corresponds with work finding that naturalization catalyzes migrant political participation.[57]

Citizenship in American Coalfields

The political contours of the coal industry varied widely across the country, with immigrants' access to political power depending largely on the mine at which they worked. In much of central Appalachia, miners were denied meaningful access to the franchise. The labor leader Samuel Gompers described

[49]The early 20th century is regarded as an era of high labor mobility (Hiscox 2001). This labor mobility extended to the coal industry (Cantrell 1988; Fishback 1992; Andrews 2008).

[50]Cohen 2014.

[51]Cantrell 1988; Beik 2006. Quote from the charter of a Polish association in Pennsylvania (Beik 2006, 125).

[52]Fishback 1992.

[53]Andrews 2008, 171.

[54]Biavaschi, Giulietti, and Siddique 2017, fn. 10.

[55]Shertzer 2016. Cf. Dancygier 2017.

[56]Giuliano and Tabellini 2020.

[57]Hainmueller, Hangartner, and Pietrantuono 2015, 2017. Hainmueller, Hangartner, and Pietrantuono 2017 notably find that the positive effects of naturalization on participation are strongest for the most marginalized migrant groups.

coalfields in West Virginia in the early 1900s as "the last remains of industrial autocracy in America."[58] Mine operators maintained a tight grip over life in their company towns, acting as unfettered political machines. The flow of political information was carefully controlled. Company guards often flagrantly coerced workers into voting the company line, sometimes simply handing miners pre-filled ballots. In no way were "citizens there allowed [...] to express their preference in these elections," reported Department of Justice officials at the time.[59] Similar conditions prevailed in western states, the setting for Upton Sinclair's *King Coal*, where miners lived in isolated company camps "carefully designed to inculcate subservience and loyalty."[60]

Elsewhere, workers enjoyed greater political autonomy. In Pennsylvania, then the heart of the coal industry, miners were active in local political life. Miners were, for example, involved in the establishment of the labor-oriented Greenback Party in the 1870s.[61] They ran for local political office, with a seat in government providing an avenue for advancing their interests that was seen as more reliable and potentially more profitable than a strategy of labor strikes and direct confrontations with mine operators. Enfranchised miners had their poll taxes paid by local power brokers and, as with immigrants elsewhere, enjoyed access to the services provided by partisan patronage networks.[62] In other coalfields, from Alabama to Illinois, miners were similarly highly attentive to local and national politics, seeking to assert their political agency with frequent debate about the candidates who would best advance the workers' cause. When under economic pressure, miners "pinned their hopes for change on the ballot box."[63]

When local mines were steadily growing — avoiding negative production shocks — immigrants with greater group exposure to the industry should have felt less need to invest in political assimilation. In contexts of coal shocks, exposure to local mines should have led such immigrants to increasingly seek the secure benefits of citizenship.[64] Based on the above theory, we should expect that *group concentration in coal suppressed naturalization in periods of steady growth, but increasingly less so amid decline*.

Naturalization is sometimes treated as part of suite of assimilation outcomes, alongside indicators of

[58]Lambert 2018, 80.
[59]Corbin 2015, 11–12.
[60]Andrews 2008, 197.
[61]French 1981.
[62]**?**Arnold 2014.
[63]Caldemeyer 2021, 161. Economic scarcity may sometimes ignite immigrant-native conflict (Dancygier 2010). However, nativism in the early 20th century U.S. was largely disconnected from issues of economic competition (Tabellini 2020).
[64]Industrial decline may sometimes diminish the total pool of political rents by reducing government income. This was unlikely a major factor in the early 20th century, which featured little corporate taxation (*Tax Foundation* 2012, <bit.ly/3te93PD>) and generally was a period of growth in coal.

social or cultural assimilation.[65] However, naturalization was distinct from social assimilation into the native white populace.[66] If immigrants were motivated by the political benefits of naturalization, as opposed to a general desire to socially assimilate or obtain the status benefits of national identification,[67] we should observe the greatest variation in naturalization rates in areas where immigrants could meaningfully exercise political voice — areas where workers enjoyed greater political autonomy and where elections were relatively competitive. This leads us to expect that *the conditional relationship between group concentration and naturalization was most apparent in areas where the benefits of political participation were most lucrative*.

Empirical Strategy

I test these hypotheses with individual-level data on immigrant naturalization and county-level data on coal production. Using complete-count decennial U.S. census records between 1900 and 1920,[68] I trace how single individuals assimilated over time. I compare immigrants within counties and states, leveraging variation in ethnic groups' concentration in nearby mines to assess how naturalization rates diverged as those mines grew and declined.

To track immigrants' behavior, I rely on recently devised automated methods for linking single individuals across multiple digitized censuses. I draw linkages from the new IPUMS Multigenerational Longitudinal Panel (MLP).[69] The IPUMS MLP builds on prior census linking efforts and is appealing in that it produces substantially more linkages without a loss in accuracy and can link both men and women. Earlier methods relied largely on individuals' names, which complicated the linking of women due to the custom of changing surnames upon marriage. With this method, I am able to track even immigrants who moved around the U.S. between censuses.

I use two sets of census linkages — 1900 to 1910 and 1910 to 1920 — that I stack into a single dataset for analysis purposes. I focus on the period of 1900–20 due to the prevalence of within-group resource sharing for European immigrants at this time.[70] The unit of analysis is the matched individual in a given matching range (see Figure 2).

[65] E.g., Fouka 2019; Fouka, Mazumder, and Tabellini 2021.
[66] **?**Beik 2006.
[67] Cf. Shayo 2009.
[68] Ruggles et al. 2019.
[69] Helgertz et al. 2020.
[70] Cohen 2014.

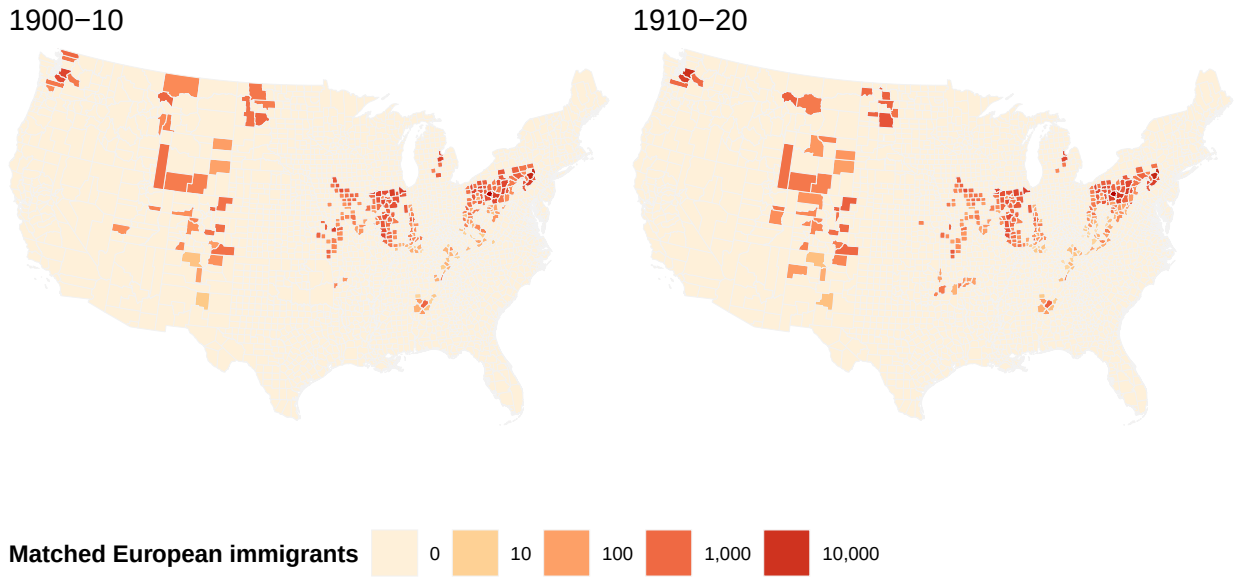

Figure 2: Geographic distribution of immigrants in coal counties matched across censuses. ***Note:*** Immigrants are matched and remain in the sample even if they migrate out of a coal-producing county between censuses.

While these years featured mounting nativist resistance to European immigration, particularly following World War I, there is little evidence that the degree of nativist animosity faced by immigrants varied with their group's concentration in coal or with shifts in the industry. The cultural origins of nativism in this era produced a disconnect between anti-immigrant backlashes and local economic conditions.[71] Accordingly, although exposure to nativism encouraged some immigrants to assimilate, this is unlikely to bias the statistical analyses described here.[72]

Variable Measurement

Political assimilation To measure political assimilation, I construct a binary variable that records if a non-citizen immigrant successfully naturalized between consecutive censuses. In a supplementary test, I expand this definition to include declarations of intention to naturalize.

Coal shocks To measure conditions in local coal mines, I transcribe annual coal production data at the county level from editions of *Mineral Resources of the United States*, an historical publication of the U.S.

[71] Tabellini 2020.

[72] Fouka 2019. In other words, group concentration in the coal industry generated incentives around assimilation in addition to any produced by nativist backlashes.

Geological Survey. Using these production data, I construct a measure of the intensity of negative shocks experienced by a county's coal mines between the enumeration of consecutive censuses (sum of all year-over-year percentage declines in that county-decade). Low "shock intensities" indicate that a county's mines were steadily growing, with minimal intra-decade production declines. High shock intensities indicate that a county's mines experienced severe negative shocks. I take the square root of this measure (see Appendix B for additional discussion).

Group concentration To measure immigrants' group exposure to local coal mining (concentration of ethnic groups in coal), I first classify immigrants into 36 distinct groups based on their places of birth and mother tongues (see Appendix A). Upon classifying immigrants, I record the percentage of workers in each immigrant group employed in coal mining in each county at the start of each decade (ahead of the measurement of coal shocks).[73] The following equation describes the calculation of this variable for a given group g in county c at time t. Due to its rightward skew, I take its square root.

$$\text{Group concentration}_{cgt} = \sqrt{\frac{\text{Coal miners}_{cgt}}{\text{All workers}_{cgt}}}$$

While immigrants often featured prominently in mines, levels of group concentration varied widely. In 1910, for example, 87% of the 1,297 Austrian immigrant workers in Las Animas County, Colorado, were employed in coal, compared to 65% of Italian immigrants in the area. East to Williamson County, Illinois, 96% of Russian immigrants worked in local mines, far more than the 57% of Irish immigrants in those mines. Across 1900 and 1910, the average European immigrant in coal-producing counties had 31% of their local coethnics working in coal.

One concern is that group concentration in coal was not randomly assigned. As I compare immigrants within the same county, my identifying assumption is that within-county variation in groups' exposure to local mines at the start of a decade was independent of performance in those mines over the ensuing decade. In other words, I assume that groups in the same county did not differentially sort into or out of coal mines according to future, yet-to-be-observed production changes in those mines. I identify

[73] I define "workers" as individuals for whom an industry of employment is listed in the census; in IPUMS USA datasets (Ruggles et al. 2019), an IND1950 value between 105 and 976. Group concentration is measured at the start of a decade (e.g., 1900). Shocks to coal are measured over the ensuing decade (e.g., 1900–1909). While the timing of the group concentration measure overlaps with the time frame of the coal shock measure, censuses (the source of the group concentration measure) were enumerated early in the year — the true temporal overlap is accordingly minimal.

little historical qualitative evidence to suggest that this was the case. Further, while I find quantitatively that group concentrations tended to be lower in counties with declining coal industries, I crucially do not find systematic differences between groups in this regard (see Appendix A). Though threats to inference cannot be ruled out entirely, the possible endogeneity of group concentration does not appear to be a major issue.

Covariates The full regression models include a set of individual- and county-level covariates, all based on complete-count census records from the start of a given decade (further details in Appendix C). At the individual level, I condition on an immigrant's first year of emigration to the U.S., as recent immigrants may have been less likely to assimilate than longer-term immigrants. I further condition on whether a given immigrant was living with a spouse, which provides an indication of whether an immigrant intended to stay in the U.S. permanently; temporary migrants often left behind family in Europe. Immigrants' economic class may have additionally affected the perceived benefits of assimilation; to account for this, I control for an estimate of individuals' employment income. Lastly, I control for an immigrant group's share of a county's population, given work attributing assimilation to group size.[74]

I include four covariates at the county-level. I record each county's reliance on coal mining for each census, measured as the percentage of workers in a county reporting an occupation in coal. I also record the share of residents living in rural areas (as recorded in the census), as well as the Black share of each county's population, which may have affected immigrants' interest in assimilating.[75]

Finally, I control for the health of a county's non-coal economy to separate coal-specific shocks from instances of general economic decline. To distinguish coal shocks from broader economic shocks, I compute a Bartik estimate of decline in local non-coal economies. Bartik estimates rest on an interaction of local industry shares with national industry-level growth patterns.[76] Pairing complete-count census data on local employment shares with national-level production data, I calculate and control for negative shocks to non-coal industries for each county-decade under analysis. I include this covariate in all models.

The full dataset is limited to European immigrants (at least 21 years of age) residing in counties actively producing coal at the start of a given decade. Importantly, immigrants remain in the sample even if they moved out of coal-producing counties between censuses. I exclude immigrants in counties where

[74] E.g., Shertzer 2016.
[75] Fouka, Mazumder, and Tabellini 2021.
[76] Goldsmith-Pinkham, Sorkin, and Swift 2020.

borders were changed during a given decade. This dataset totals 698,809 immigrants matched across census pairs, initially distributed across 318 counties and 23 states. Tests of naturalization are limited to non-citizen immigrants eligible to begin naturalization proceedings (men of at least 21 years of age); other tests involve the remaining observations. About 29% of European immigrants in coal counties were successfully matched, near the high end of typical match rates in the literature[77] (see Appendix D for details).

Econometric Model

Using these data, I estimate the model

$$Y_{icgs(t+10)} = \beta \left[\text{shock intensity}_{c(t \to t+9)} \times \left(\text{group concentration}_{cgt} + \mathbf{W}_{it} + \mathbf{X}_{ct} \right) \right] + \gamma_c + \delta_{st} + \varepsilon_{icgs(t+10)}$$

where i indexes individuals, c counties, g immigrant groups, s states, and t years. β is a vector of coefficients, $\mathbf{W}_{it}$ is a vector of individual-level covariates for each census year, $\mathbf{X}_{ct}$ is a vector of county-level covariates for each census year, and $\varepsilon_{icgs(t+10)}$ is an error term clustered at the county-group level. I additionally include two fixed effects terms: a county fixed effects term γ_c and a state-year fixed effects term δ_{st}, which accounts for the distinct political and economic trajectories of different states. The outcome $Y_{icgs(t+10)}$ is the assimilation dummy. Single-interaction models can introduce bias by overlooking interactive relationships between the moderator and covariates;[78] I accordingly estimate this as a fully moderated model. In supplementary tests, I use a "binning estimator" to address potential issues of linear extrapolation and ensure common support in the moderator.[79] I also estimate models without the full covariate set, eliminating the potential issue of covariate endogeneity.

I estimate this model with weighted least squares. One challenge in using matched census data is biased selection into matching. As is customary, I correct for this by weighting individuals according to their likelihood of having been matched. I compare the sets of matched individuals to the corresponding complete-count censuses (limited to coal-producing counties), predicting each individual's probability of having been matched according to their age, sex, literacy, place of residence, immigrant status, and occupation (see Appendix C).

[77] See, e.g., Abramitzky, Boustan, and Eriksson 2014.
[78] Blackwell and Olson 2021.
[79] Hainmueller, Mummolo, and Xu 2019.

Results

Estimation results, with and without the full covariate set, offer support for this paper's theory. As illustrated in Figure 3, group concentration in coal had a strong negative relationship with political assimilation when local mines were steadily growing. Broad differences between ethnic groups in naturalization rates emerged around these steadily growing mines, with such cleavages eroding when negative shocks battered mines. Around the healthiest tercile of mines (lowest shock intensity), a ten-percentage point increase in group concentration corresponded to a 12.5-point decline in the likelihood of attaining citizenship. Yet around the tercile of mines experiencing the most severe shocks, this same difference in group concentration was associated with a mere three-point decline in naturalization (see Appendix G, Figure G7 for further details on tercile tests). This convergence was likely driven by higher rates of naturalization among members of groups concentrated in coal (Appendix E, Table E2).

	Naturalized	
	Model 1	**Model 2**
Group concentration	−0.652***	−0.587***
	(0.103)	(0.107)
Shock intensity	−0.852***	3.312
	(0.177)	(2.063)
Concentration × shock	0.428***	0.487***
	(0.098)	(0.112)
All covariates		✓
County FEs	✓	✓
State-year FEs	✓	✓
N	75056	59503
Counties	311	298
Adj. R-squared	0.122	0.170

***p < .001; **p < .01; *p < .05

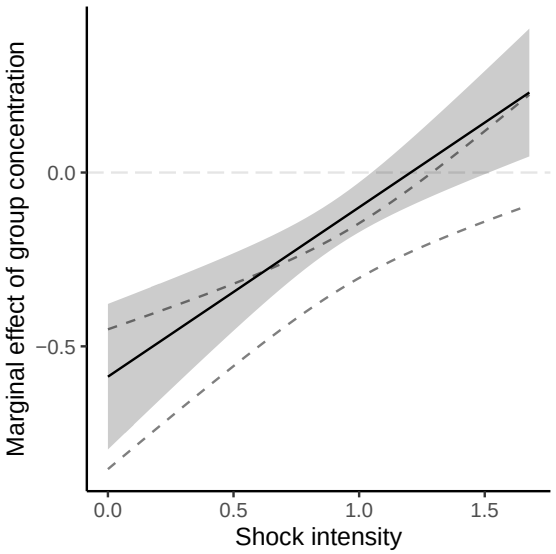

Figure 3: Regressions of the successful naturalization dummy on the interaction of shock intensity and group concentration. Standard errors clustered at the county-group level. 95% confidence intervals are plotted; dashed lines indicate the confidence intervals for the model without all covariates.

The theory described above anticipates that these changes in naturalization rates were apparent among both immigrants working in mines and coethnics employed elsewhere. To test this, I distinguish between two sets of immigrants: (*a*) immigrant miners and (*b*) those neither working in the industry nor

living with any family member in the industry.[80] The results of these tests, depicted in Figure 4, indicate that ethnic enclaves shaped naturalization rates in and around local mines by transmitting the benefits of growth and costs of decline: group concentration in steadily growing mines suppressed naturalization among both miners themselves and coethnics employed elsewhere.

	Naturalized			
	Immigrant miners		Coal-adjacent immigrants	
	Model 1	**Model 2**	**Model 3**	**Model 4**
Group concentration	−0.833***	−0.789***	−0.764***	−0.751***
	(0.137)	(0.146)	(0.166)	(0.158)
Shock intensity	−0.717***	10.112**	−1.350***	1.065
	(0.204)	(3.564)	(0.262)	(2.480)
Concentration × shock	0.536***	0.599***	0.679***	0.678***
	(0.151)	(0.170)	(0.153)	(0.162)
All covariates		✓		✓
County FEs	✓	✓	✓	✓
State-year FEs	✓	✓	✓	✓
N	23415	23374	50552	35503
Adj. R-squared	0.106	0.132	0.120	0.186

***p < .001; **p < .01; *p < .05

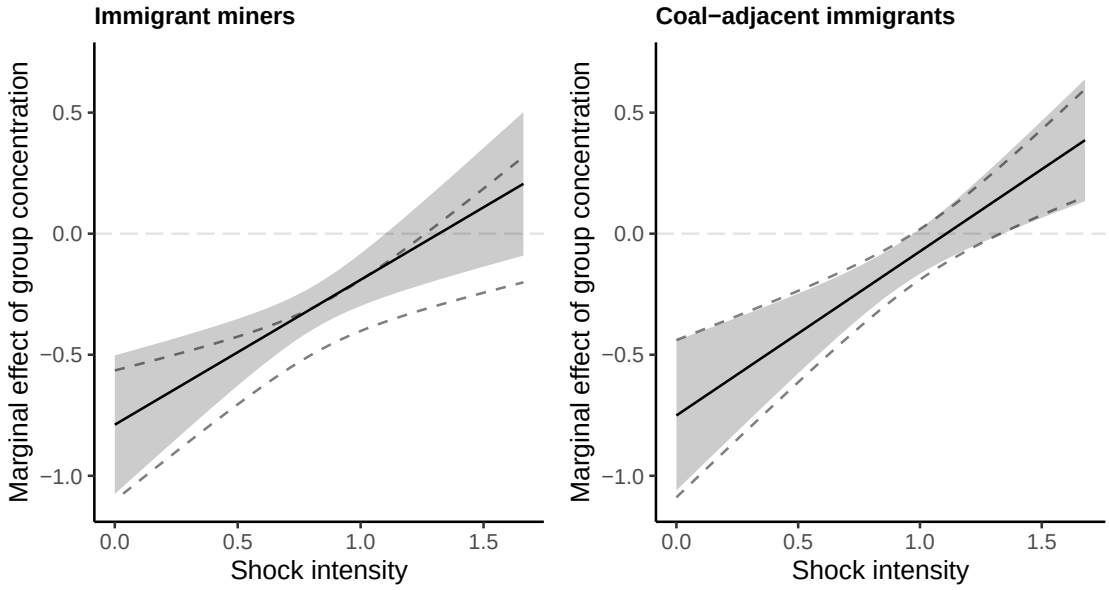

Figure 4: Interactions of group concentration and shock intensity on naturalization. Plots on the left limited to immigrants working in coal; those on the right limited to immigrants working outside coal living with no family members in coal. 95% confidence intervals plotted using robust standard errors clustered at the group-county level. Dashed lines indicate the confidence intervals for models without all covariates.

[80] Family members working in coal are identified using complete-count census records.

Across both immigrant miners and coal-adjacent immigrants, varying group concentrations in local mines drove clear wedges between immigrants in times of consistent growth. Miners in more exposed groups were far less likely to naturalize than other miners in the same coalfields; in the most steadily growing quintile of mines, a ten-point increase in group exposure suppressed naturalization rates by over 23 percentage points in expectation. Yet these differences were substantially narrower in mines experiencing negative shocks; in the quintile of mines where negative shocks were most severe, that same difference in group concentration corresponded to just an eight-point decline in naturalization for immigrant miners. Among coal-*adjacent* immigrants, this increase in group concentration was correlated with a 20-point decline in naturalization around consistently growing mines, yet no significant change near sharply declining mines. Note that these results are not an artificial product of linear extrapolation or a lack of common support in the decline moderator (Appendix G, Figure G7).

Political Contexts

The ability of immigrants to access the benefits of political participation varied widely across the country. If immigrants were attracted to the material benefits of citizenship — not purely the status benefits of national identification — we should primarily obtain these baseline results where those material benefits were more accessible.[81] I test this using two metrics: the partisan makeup of immigrants' communities and mines' geographic locations.

I first evaluate immigrants' partisan context. Mines were often situated in Republican strongholds. Across 1900 and 1910, 52% of immigrant miners were living in Republican-held congressional districts won by more than ten points (see Appendix C for data details). If immigrants were principally motivated by the material benefits of citizenship, changes in naturalization rates should have been most pronounced in more competitive districts. Many immigrants at this time were particularly inclined to naturalize when they were likely to be pivotal voters for the Democratic Party, which promised an enticing mix of patronage and programmatic policy benefits.[82]

To test this, I divide immigrants living in Republican strongholds from those elsewhere.[83] Figure 5 illustrates that the conditional relationship between group concentration and naturalization was strongest

[81] On the status benefits of national identification, see Shayo 2009.

[82] Shertzer 2016.

[83] I split the sample according to whether the county-level vote share difference between Republican and Democratic candidates for the House of Representatives was greater than the median difference in the sample across 1900 and 1910 (12.6 percentage points).

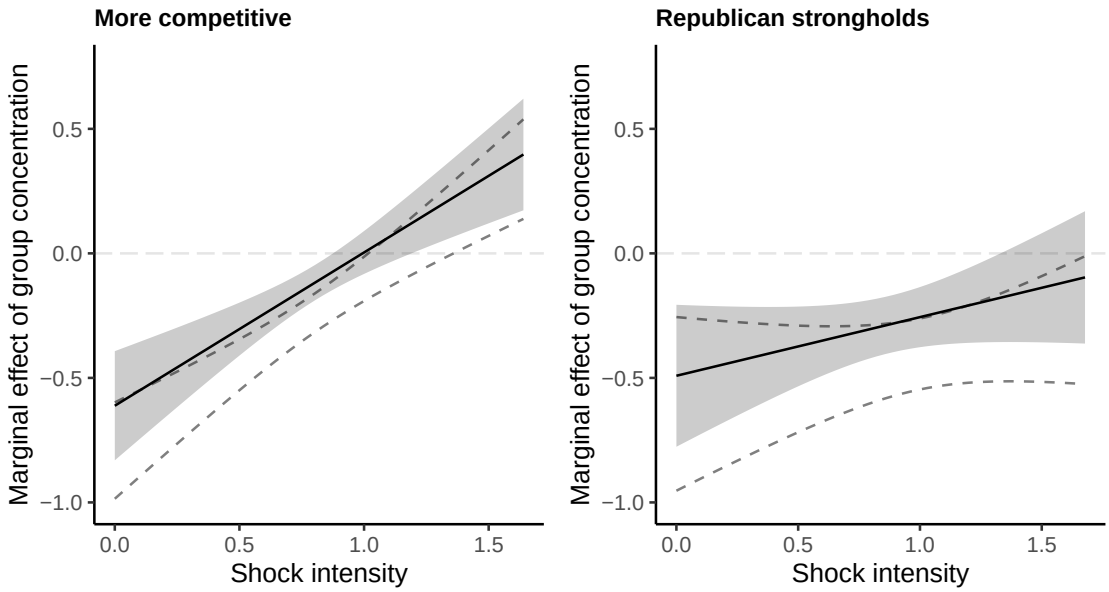

Figure 5: Interactions of group concentration and shock intensity on naturalization. Plots on the left limited to immigrants in competitive districts (n = 33,942); those on the right limited to immigrants in Republican strongholds (n = 37,402). 95% confidence intervals are plotted using robust standard errors clustered at the group-county level. Dashed lines indicate the confidence intervals for models without all covariates.

in areas where elections were relatively competitive. In these districts, immigrants in groups more concentrated in coal mines were far less likely than others to naturalize in periods of steady growth, but this negative relationship was notably attenuated around mines suffering negative shocks. There is milder evidence of this dynamic in Republican strongholds, indicating that the material benefits of naturalization, independent of any status benefits, were an important motivation for immigrants.

I now consider mines' geographic locations. As described above, immigrants' ability to participate in politics without interference from mine operators varied across the country. In states such as Pennsylvania and Illinois, miners were generally able to engage with nearby communities and in local politics. Elsewhere, namely around central Appalachian and Mountain West mines, immigrants were socially and politically isolated in company towns and camps. In these tests, I accordingly divide immigrants by their state of residence.

Figure 6 reveals that in line with expectations, the baseline results principally hold away from more restrictive coalfields. In central Appalachia and the West, where mine operators retained tight control over local elections, I observe no clear changes in naturalization rates with exposure to coal.[84] Conversely,

[84]One possible objection to this interpretation concerns the small size of this subgroup (9,227 observations), which may be the source of this null result. In a supplementary test, I draw a random set of observations from the larger subgroup ("Elsewhere") to match this smaller sample size. Results persist with this smaller sample, indicating that uneven sample sizes

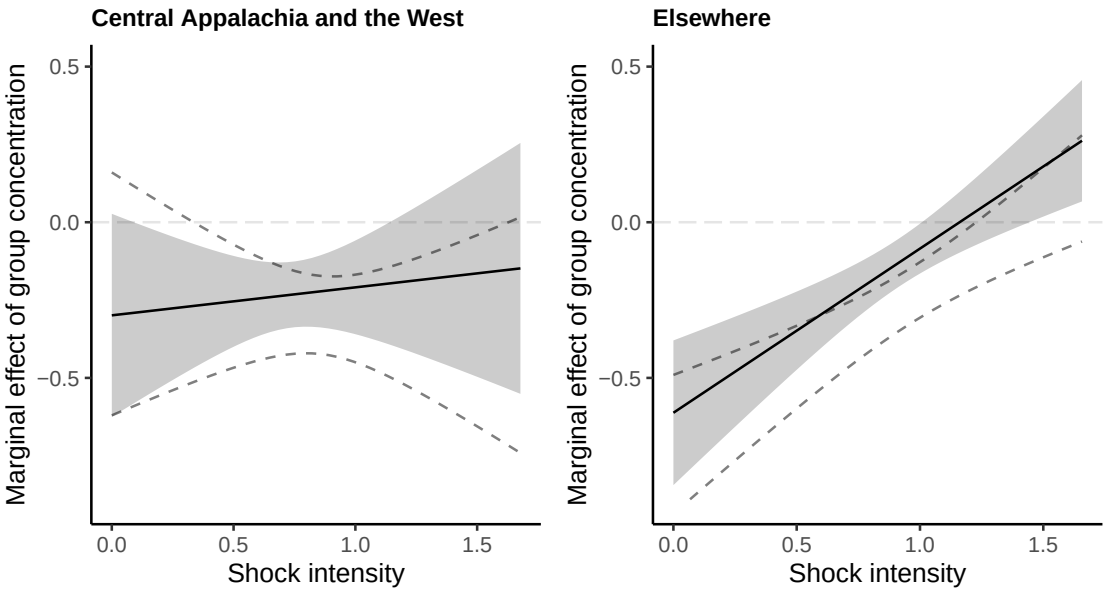

Figure 6: Interactions of group concentration and shock intensity on naturalization. "Central Appalachia and the West" includes Arizona, California, Colorado, Idaho, Kentucky, Montana, Nevada, Oregon, New Mexico, Tennessee, Utah, Virginia, Washington, West Virginia, and Wyoming (n = 9,227). Remaining states are grouped together (n = 70,086).

I obtain the baseline results for immigrants living elsewhere, where voting rights could be more meaningfully exercised. This further supports the notion that immigrants in coalfields were motivated by the material benefits of citizenship, not only the non-material status benefits that could be obtained even in areas where political influence was lacking.

Position in Ethnic Enclave

The theory laid out above focuses on the spread of information and material resources within ethnic enclaves. Here I evaluate whether assimilation patterns differed between immigrants on the interior of their enclave who principally communicated with coethnics and participated in ethnic communal life, and immigrants on the fringes of their enclave with more exposure to non-coethnics. To approximate the depth of immigrants' integration into their enclave, I use complete-count census records to identify individuals' likely exposure to non-coethnics at their places of work. To do so, I calculate for each coal-adjacent immigrant the proportion of co-workers who were coethnics.[85] Immigrants working with more non-coethnic coworkers likely had more outward-facing social ties, making them less reliant on their enclave for information and material support.

do not underly these varied results (see Appendix E, Table E4).

[85] "Co-workers" are those who worked in the same industry and same county in the same year.

Figure 7 shows that the clearest relationship between group concentration and naturalization was among immigrants working with more coethnics, who likely were more tightly connected to their ethnic enclave. There is little evidence of varied group concentrations cleaving immigrants who worked with few coethnics. Being less tied to their enclave, these immigrants were less responsive to shifts in coethnic miners' fortunes despite sharing a common ethnic identity. That these results are most pronounced for immigrants deeply embedded in their ethnic enclave underscores the capacity of industrial changes to reorient status quo group ties.

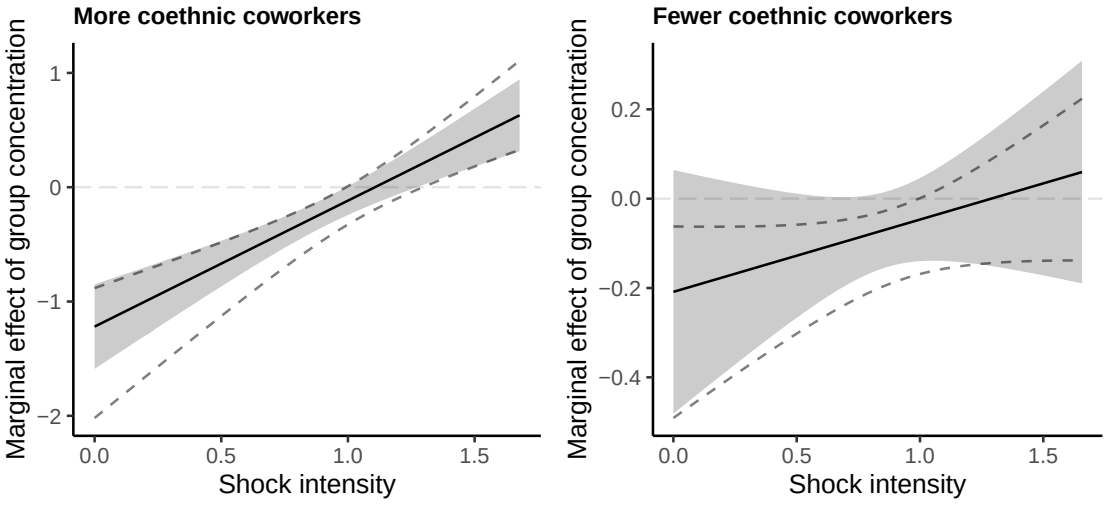

Figure 7: Interactions of group concentration and shock intensity on naturalization. Sample divided between coal-adjacent immigrants working in local industries employing more than the median share of coethnic workers (more than 3.9% of co-workers being coethnic; n = 25,260) and those working alongside fewer coethnics (at most 3.9% of co-workers being coethnics; n = 25,292).

Political or Social Assimilation

Collectively, these results show that group concentration in coal was associated with a strengthening of immigrants' bonds to their ethnic enclaves in periods of stable growth, but increasingly less so around mines weakened by negative shocks. Here I evaluate whether group exposure to coal shocks drove immigrants to wholly exit their enclave or simply loosen ties with coethnics. To do so, I consider the possibility of social assimilation: migrants' integration into the native white populace or other immigrant groups. Social assimilation yielded some material benefits, such as better labor market outcomes,[86] which may have been attractive in periods of economic stress. I evaluate this possibility using two metrics: marriage

[86]Biavaschi, Giulietti, and Siddique 2017.

to a non-coethnic (a native white citizen or non-coethnic immigrant) and acquisition of the ability to speak English.

I find little evidence that group concentration in coal was associated with social assimilation across men and women (Appendix F). This may have been due to the difficulty of social assimilation. Unlike naturalization, successful social assimilation required the assent of outgroup members — something that the many Southern and Eastern Europeans in coal towns struggled to achieve.[87] Rather than fully severing ties to their enclave, migrants with broad group exposure to coal shocks appear to have loosened ties, coming to rely less on coethnics without leaving the group entirely.

Alternative Explanations

Groups concentrated in growing mines may have included many recent migrants, attracted by the promise of good pay but unlikely to invest in assimilation. Groups concentrated in soon-to-decline mines may have instead been more comprised of longer-term immigrants; by virtue of their length of stay, they may have been likelier to assimilate for reasons independent of their group's concentration in coal. If this the case, the results described above may be due to biased selection in growing and declining mining areas.

While I control for immigrants' year of emigration to the U.S., I attempt to further rule out this explanation by splitting recent immigrants from longer-term immigrants. There is little sign that these two sets of immigrants behaved differently (see Appendix G, Figure G1). Potential selection of recent migrants into growing mining areas does not appear to explain the results described above.

A second alternative explanation concerns the results disaggregating immigrant miners from coal-adjacent immigrants. As immigrants are not observed between the enumeration of two censuses, it is possible that coal-adjacent immigrants began working in the industry sometime during that intervening period. If immigrants were likelier to do this when they belonged to more exposed groups, this may explain the significant results found for coal-adjacent immigrants.

While some coal-adjacent immigrants did enter the industry between censuses, this is unlikely to have biased the results described above. Of immigrants identified as coal-adjacent at the start of a decade, just 9.5% were working in coal by decade's end, compared to 63.6% of the immigrants who had worked in coal since the start of the decade. I further obtain the baseline results when limiting the sample to older immigrants who were unlikely to enter the industry by virtue of their age, as well as when limiting

[87] Cf. Fouka, Mazumder, and Tabellini 2021.

the sample to coal-adjacent immigrants who remained employed outside of coal at the end of a decade (Appendix G, Figure G2).

Robustness Checks

As a placebo test, I evaluate whether immigrant's tendency to naturalize varied with *future* economic contractions in their county.[88] I find null results as expected, underscoring the unique importance of contemporaneous industrial conditions in shaping the relationship between group concentration and naturalization (Appendix G, Table G1).

Other robustness checks support the main results (see remainder of Appendix G). First, I consider the possibility that the measures of shock intensity are correlated with longer-run growth trends; I find that the results are robust to controlling for intra-decadal growth in local mines and local non-coal industries. Acknowledging the possibility of ethnic ties crossing county borders, I additionally recalculate the group concentration and shock intensity variables to encompass all counties to which immigrants had a direct railroad connection; this test produces commensurate results. I further recode political assimilation to include declarations of intention to naturalize, which likewise yields similar results.

Mechanical checks similarly affirm these results. I re-cluster standard errors at the county level; results remain significant. I re-estimate the interaction models using a binning estimator, ensuring common support in the moderator, which supports the results. I re-estimate the main model, iteratively dropping each county, each ethnic group, and random sets of observations from the sample to check for highly influential outliers; the results persist. I interact the beginning-of-decade covariates with decade fixed effects to allow for differential associations by year (Appendix E, Table E1); results are consistent.

Conclusion

Economic threats to dominant ethnic groups may prompt individuals to look inwards, fomenting ethnic chauvinism and defensiveness. When we focus on marginalized groups, however, a different logic holds. For such groups, group allegiances may be strengthened by concentration in consistently growing industries and eroded by exposure to negative shocks. Groups concentrated in growing industries furnish their members with positive economic information and material resources, buttressing members' confidence

[88] For example, whether the link between group concentration and naturalization in 1910–1919 varied with economic conditions in 1920–1929.

in coethnics' ability to support their welfare. For migrants, this lessens the appeal of political assimilation. Amid industrial decline, however, the advantages of concentration dissipate, prompting migrants to politically assimilate as a means of lessening reliance on their ethnic group. The ethnic topography of an economy — the distribution of groups across industries — is an important determinant of how group boundaries and social identities evolve in contexts of economic prosperity and decay.

The historical evidence I present supports this argument. Varied ethnic concentration in coal cleaved both immigrant miners and coal-adjacent immigrants in periods of stable growth. Immigrants in groups more concentrated in local mines were substantially less likely to naturalize, confident in their economic position and group ties. Around mines buffeted by negative shocks, however, the negative relationship between group concentration and naturalization was diminished as immigrants looked beyond their coethnics for new sources of support. Whereas growth in the coal industry sustained immigrants' allegiances to their ethnic enclaves, decline corresponded to a transformation, though not complete severing, of extant group ties. These trends were most evident among immigrants who were closely tied to their ethnic enclaves and who lived in areas where the material benefits of naturalization were attainable.

This argument should generalize to other industries. Historical accounts suggest that shocks to U.S. manufacturing in the early twentieth century, for example, prompted a similar fraying of ethnic ties among immigrant groups concentrated in the industry.[89] The findings should further generalize to other time periods and countries, particularly democracies marked by ethnic fragmentation and truncated welfare states. Such democracies are characteristic of much of the developing world today, which similarly often feature ethnic groups equipped with resource-sharing technologies.[90] The argument put forth here may also travel to pockets of developed democracies, such as immigrant communities in the contemporary U.S., which feature resource sharing among coethnics and often concentrate in specific industries.[91]

These findings point to several avenues for future research. Scholars, for example, might consider how political elites respond strategically to the concentration of marginalized groups in certain industries. In periods of steady growth, politicians may neglect such groups as levels of political engagement remain low. However, politicians may actively seek to capitalize on the anxieties of groups concentrated in declining industries, promising them material benefits in exchange for their votes. A potentially fruitful avenue for future work may be to dissect how politicians decide upon the nature of such benefits. Do politicians opt

[89] Cohen 2014.
[90] Holland 2018; Munshi 2014.
[91] Munshi 2003; Garcia 2005.

for direct investments in an ethnic enclave, which might ignite nativist backlash, or instead seek subsidies to prop up an industry in which targeted groups are concentrated, which may not be identified as clearly by nativists as a transfer to ostracized groups? Researchers might also explore strategic behavior on the part of leaders within marginalized groups. Do leaders of groups concentrated in volatile industries seek to reinforce the cultural attachments of group members to dissuade exit amid industrial decline?

Another promising direction concerns gender identity and economic change, particularly in the context of male-dominated fossil fuel industries.[92] Recent scholarship illustrates how economic shocks to women's families can transform patriarchal norms around political engagement.[93] Scholars might probe whether, analogous to this paper's argument, growth in fossil fuel industries historically accentuated the "gender gap" in rates of political participation in patriarchal settings. In periods of decline, as male relatives in the industry lose income and familial networks become increasingly stressed, women may increasingly look to exit traditional domestic structures and become more politically active.

Scholars might also investigate what these findings portend for the future politics of climate change, which are likely to be defined by transitions away from fossil fuel industries.[94] Outstanding questions include the extent to which these transitions will transform patterns of political contestation, and whether they will trigger identity-based backlashes like those attributed to economic globalization. Notably, fossil fuel industries remain closely connected to marginalized groups today. In India, for example, migrant communities have close ties to nearby coal mines; in the U.S., immigrants are well represented in oil and gas workforces.[95] This paper suggests that groups concentrated in these industries may increasingly look to assimilate into local polities as the industries contract. By exploring how ethnic groups are distributed across industries, scholars may be able to shed light on how marginalized groups will cope with impending climate transitions and how such transitions will transform identity politics in the years ahead.

[92] See, e.g., Bush and Clayton 2021.
[93] Gaikwad, Lin, and Zucker 2021.
[94] Colgan, Green, and Hale 2021.
[95] *Al Jazeera* 2014, <bit.ly/2StNPRf>; *OilPrice* 2019, <bit.ly/3sfrYuj>.

References

Abou-Chadi, Tarik, and Thomas Kurer. 2021. "Economic Risk within the Household and Voting for the Radical Right." *World Politics* (forthcoming).

Abramitzky, Ran, and Leah Boustan. 2017. "Immigration in American Economic History." *Journal of Economic Literature* 55 (4): 1311–1345.

Abramitzky, Ran, Leah Boustan, and Katherine Eriksson. 2014. "A Nation of Immigrants: Assimilation and Economic Outcomes in the Age of Mass Migration." *Journal of Political Economy* 122 (3): 467–506.

Ahlquist, John, Mark Copelovitch, and Stefanie Walter. 2020. "The Political Consequences of External Economic Shocks: Evidence from Poland." *American Journal of Political Science* 64 (4): 904–920.

Alt, James, Amalie Jensen, Horacio Larreguy, David Lassen, and John Marshall. 2021. "Diffusing Political Concerns: How Unemployment Information Passed Between Social Ties Influences Danish Voters." *Journal of Politics* (forthcoming).

Andrews, Thomas. 2008. *Killing for Coal: America's Deadliest Labor War*. Cambridge: Harvard University Press.

Arnold, Andrew. 2014. *Fueling the Gilded Age: Railroads, Miners, and Disorder in Pennsylvania Coal Country*. New York: New York University Press.

Autor, David H., David Dorn, and Gordon H. Hanson. 2013. "The China Syndrome: Local Labor Market Effects of Import Competition in the United States." *American Economic Review* 103 (6): 2121–2168.

Baccini, Leonardo, and Stephen Weymouth. 2021. "Gone For Good: Deindustrialization, White Voter Backlash, and U.S. Presidential Voting." *American Political Science Review* 115 (2): 550–567.

Ballard-Rosa, Cameron, Amalie Jensen, and Kenneth Scheve. 2021. "Economic Decline, Social Identity, and Authoritarian Values in the United States." *International Studies Quarterly* (forthcoming).

Ballard-Rosa, Cameron, Mashail Malik, Stephanie Rickard, and Kenneth Scheve. 2020. "The Economic Origins of Authoritarian Values: Evidence from Local Trade Shocks in the United Kingdom." *Comparative Political Studies* (forthcoming).

Becker, Sascha, and Luigi Pascali. 2019. "Religion, Division of Labor, and Conflict: Anti-semitism in Germany over 600 Years." *American Economic Review* 109 (5): 1764–1804.

Beik, Mildred. 2006. *The Miners of Windber: The Struggles of New Immigrants for Unionization, 1890s–1930s*. University Park: Penn State Press.

Bhavnani, Rikhil, and Bethany Lacina. 2015. "The Effects of Weather-Induced Migration on Sons of the Soil Riots in India." *World Politics* 67 (4): 760–794.

Biavaschi, Costanza, Corrado Giulietti, and Zahra Siddique. 2017. "The Economic Payoff of Name Americanization." *Journal of Labor Economics* 35 (4): 1089–1116.

Blackwell, Matthew, and Michael Olson. 2021. "Reducing Model Misspecification and Bias in the Estimation of Interactions." *Political Analysis* (forthcoming).

Broz, J. Lawrence, Jeffry Frieden, and Stephen Weymouth. 2021. "Populism in Place: The Economic Geography of the Globalization Backlash." *International Organization* 75 (2): 464–494.

Brubaker, Rogers. 2002. "Ethnicity without Groups." *European Journal of Sociology* 43 (2): 163–189.

Brutger, Ryan, and Alexandra Guisinger. 2021. "Labor Market Volatility, Gender, and Trade Preferences." *Journal of Experimental Political Science* (forthcoming).

Bryan, Gharad, Shyamal Chowdhury, and Ahmed Mushfiq Mobarak. 2014. "Underinvestment in a Profitable Technology: The Case of Seasonal Migration in Bangladesh." *Econometrica* 82 (5): 1671–1748.

Bush, Sarah, and Amanda Clayton. 2021. "Facing Change: Identity and Cross-National Responses to Climate Change." Manuscript, Yale University and Vanderbilt University. <bit.ly/3vVPtsC>.

Caldemeyer, Dana. 2021. *Union Renegades: Miners, Capitalism, and Organizing in the Gilded Age*. Champaign: University of Illinois Press.

Cantrell, Doug. 1988. "Immigrants and Community in Harlan County, 1910–1930." *Register of the Kentucky Historical Society* 86 (2): 119–141.

Cohen, Lizabeth. 2014. *Making a New Deal: Industrial Workers in Chicago, 1919–1939*. 2nd ed. New York: Cambridge University Press.

Colgan, Jeff, Jessica F. Green, and Thomas Hale. 2021. "Asset Revaluation and the Existential Politics of Climate Change." *International Organization* 75 (2): 586–610.

Corbin, David. 2015. *Life, Work, and Rebellion in the Coal Fields: The Southern West Virginia Miners, 1880–1922*. 2 ed. Morgantown: West Virginia University Press.

Dancygier, Rafaela. 2010. *Immigration and Conflict in Europe*. New York: Cambridge University Press.

Dancygier, Rafaela. 2017. *Dilemmas of Inclusion: Muslims in European Politics*. Princeton: Princeton University Press.

Dehdari, Sirus. 2020. "Economic Distress and Support for Radical Right Parties – Evidence from Sweden." *Comparative Political Studies* (forthcoming).

Delpont, Victor. 1986. "Interview by Doug Cantrell." Appalachia: Immigrants in the Coal Fields Oral History Project. Louie B. Nunn Center for Oral History, University of Kentucky Libraries. <kentuckyoralhistory.org/ark:/16417/xt7h445hcp4d>.

Eifert, Benn, Edward Miguel, and Daniel Posner. 2010. "Political Competition and Ethnic Identification in Africa." *American Journal of Political Science* 54 (2): 494–510.

Fafchamps, Marcel, and Flore Gubert. 2007. "The Formation of Risk Sharing Networks." *Journal of Development Economics* 83 (2): 326–350.

Fearon, James, and David Laitin. 1996. "Explaining Interethnic Cooperation." *American Political Science Review* 90 (4): 715–735.

Fishback, Price. 1992. *Soft Coal, Hard Choices: The Economic Welfare of Bituminous Coal Miners, 1890–1930*. New York: Oxford University Press.

Fouka, Vasiliki. 2019. "How Do Immigrants Respond to Discrimination? The Case of Germans in the US During World War I." *American Political Science Review* 113 (2): 405–422.

Fouka, Vasiliki, Soumyajit Mazumder, and Marco Tabellini. 2021. "From Immigrants to Americans: Race and Assimilation During the Great Migration." *Review of Economic Studies* (forthcoming).

French, John. 1981. "'Reaping the Whirlwind': The Origins of the Allegheny County Greenback Labor Party in 1877." *Western Pennsylvania Historical Magazine* 64 (2): 97–119.

Gaikwad, Nikhar, Erin Lin, and Noah Zucker. 2021. "Genocide and the Gender Gap in Political Representation." Manuscript, Columbia University and Ohio State University, <ssrn.com/abstract=3801980>.

Gaikwad, Nikhar, and Gareth Nellis. 2021. "Overcoming the Political Exclusion of Migrants: Theory and Experimental Evidence from India." *American Political Science Review* (forthcoming).

Gaikwad, Nikhar, and Pavithra Suryanarayan. 2019. "Attitudes Toward Globalization in Ranked Ethnic Societies." Manuscript, Columbia Univerity and Johns Hopkins University, <ssrn.com/abstract=3398262>.

Gailmard, Sean. 2021. "Theory, History, and Political Economy." *Journal of Historical Political Economy* 1 (1): 69–104.

Garcia, Carlos. 2005. "Buscando Trabajo: Social Networking Among Immigrants From Mexico to the United States." *Hispanic Journal of Behavioral Sciences* 27 (1): 3–22.

Gidron, Noam, and Peter Hall. 2017. "The Politics of Social Status: Economic and Cultural Roots of the Populist Right." *British Journal of Sociology* 68 (S1): S57–S84.

Giuliano, Paola, and Marco Tabellini. 2020. "The Seeds of Ideology: Historical Immigration and Political Preferences in the United States." NBER Working Paper 27238.

Goldsmith-Pinkham, Paul, Isaac Sorkin, and Henry Swift. 2020. "Bartik Instruments: What, When, Why and How." *American Economic Review* (forthcoming).

Goodman, Sara Wallace. 2012. "Fortifying Citizenship: Policy Strategies for Civic Integration in Western Europe." *World Politics* 64 (4): 659–698.

Guisinger, Alexandra. 2017. *American Opinion on Trade: Preferences without Politics*. New York: Oxford University Press.

Hainmueller, Jens, Dominik Hangartner, and Giuseppe Pietrantuono. 2015. "Naturalization Fosters the Long-Term Political Integration of Immigrants." *Proceedings of the National Academy of Sciences* 112 (41): 12651–12656.

Hainmueller, Jens, Dominik Hangartner, and Giuseppe Pietrantuono. 2017. "Catalyst or Crown: Does Naturalization Promote the Long-Term Social Integration of Immigrants?" *American Political Science Review* 111 (2): 256–276.

Hainmueller, Jens, Jonathan Mummolo, and Yiqing Xu. 2019. "How Much Should We Trust Estimates from Multiplicative Interaction Models? Simple Tools to Improve Empirical Practice." *Political Analysis* 27 (2): 163–192.

Hechter, Michael. 1974. "The Political Economy of Ethnic Change." *American Journal of Sociology* 79 (5): 1151–1178.

Helgertz, Jonas, Steven Ruggles, John Warren, Catherine Fitch, Ronald Goeken, David Hacker, Matt Nelson, Joseph Price, Evan Roberts, and Matthew Sobek. 2020. "IPUMS Multigenerational Longitudinal Panel: Version 1.0 [dataset]." IPUMS, Minneapolis, MN, <https://doi.org/10.18128/D016.V1.0>.

Hiebert, David. 1993. "Jewish Immigrants and the Garment Industry of Toronto, 1901–1931: A Study of Ethnic and Class Relations." *Annals of the Association of American Geographers* 83: 243–271.

Hiscox, Michael J. 2001. "Class Versus Industry Cleavages: Inter-Industry Factor Mobility and the Politics of Trade." *International Organization* 55 (1): 1–46.

Holland, Alisha. 2018. "Diminished Expectations: Redistributive Preferences in Truncated Welfare States." *World Politics* 70 (4): 555–594.

Jardina, Ashley. 2019. *White Identity Politics*. New York: Cambridge University Press.

Katznelson, Ira. 1981. *City Trenches: Urban Politics and the Patterning of Class in the United States*. Chicago: University of Chicago Press.

Laitin, David D. 1998. *Identity in Formation: The Russian-Speaking Populations in the Near Abroad*. Ithaca: Cornell University Press.

Lambert, Josiah. 2018. *"If the Workers Took a Notion": The Right to Strike and American Political Development*. Ithaca: Cornell University Press.

Malkki, Liisa. 1995. *Purity and Exile: Violence, Memory, and National Cosmology among Hutu Refugees in Tanzania*. Chicago: University of Chicago Press.

Mansfield, Edward, and Diana Mutz. 2009. "Support for Free Trade: Self-Interest, Sociotropic Politics, and Out-Group Anxiety." *International Organization* 63 (3): 425–457.

Mitchell, Timothy. 2011. *Carbon Democracy: Political Power in the Age of Oil*. New York: Verso.

Munshi, Kaivan. 2003. "Networks in the Modern Economy: Mexican Migrants in the U. S. Labor Market." *Quarterly Journal of Economics* 118 (2): 549–599.

Munshi, Kaivan. 2014. "Community Networks and the Process of Development." *Journal of Economic Perspectives* 28 (4): 49–76.

Osgood, Iain, and Margaret Peters. 2017. "Escape Through Export? Women-Owned Enterprises, Domestic Discrimination, and Global Markets." *Quarterly Journal of Political Science* 12 (2): 143–183.

Patterson, Orlando. 1975. "Context and Choice in Ethnic Allegiance." In *Ethnicity: Theory and Experience*, ed. Nathan Glazer, and Daniel Patrick Moynihan. Cambridge: Harvard University Press.

Peters, Margaret. 2017. *Trading Barriers: Immigration and the Remaking of Globalization*. Princeton: Princeton University Press.

Pons, Vincent, and Guillaume Liegey. 2019. "Increasing the Electoral Participation of Immigrants: Experimental Evidence from France." *Economic Journal* 129 (617): 481–508.

Posner, Daniel. 2004. "The Political Salience of Cultural Difference: Why Chewas and Tumbukas are Allies in Zambia and Adversaries in Malawi." *American Political Science Review* 98 (4): 529–545.

Putnam, Robert, Robert Leonardi, and Raffaella Nanetti. 1993. *Making Democracy Work: Civic Traditions in Modern Italy*. Princeton: Princeton University Press.

Rodrik, Dani. 2018. "Populism and the Economics of Globalization." *Journal of International Business Policy* 1: 12–33.

Ruggles, Steven, Sarah Flood, Ronald Goeken, Josiah Grover, Erin Meyer, Jose Pacas, and Matthew Sobek. 2019. "IPUMS USA: Version 9.0 [dataset]." IPUMS, Minneapolis, MN. <doi.org/10.18128/D010.V9.0>.

Ruggles, Steven, Sarah Flood, Sophia Foster, Ronald Goeken, Jose Pacas, Megan Schouweiler, and Matthew Sobek. 2021. "IPUMS USA: Version 11.0 [dataset]." IPUMS, Minneapolis, MN. <doi.org/10.18128/D010.V11.0>.

Scott, James. 1976. *The Moral Economy of the Peasant: Rebellion and Subsistence in Southeast Asia*. New Haven: Yale University Press.

Shayo, Moses. 2009. "A Model of Social Identity with an Application to Political Economy: Nation, Class, and Redistribution." *American Political Science Review* 103 (2): 147–174.

Shertzer, Allison. 2016. "Immigrant Group Size and Political Mobilization: Evidence From European Migration to the United States." *Journal of Public Economics* 139: 1–12.

Shifflett, Crandall. 1991. *Coal Towns: Life, Work, and Culture in Company Towns of Southern Appalachia, 1880–1960*. Knoxville: University of Tennessee Press.

Suryanarayan, Pavithra, and Steven White. 2021. "Slavery, Reconstruction, and Bureaucratic Capacity in the American South." *American Political Science Review* 115 (2): 568–584.

Tabellini, Marco. 2020. "Gifts of the Immigrants, Woes of the Natives: Lessons from the Age of Mass Migration." *Review of Economic Studies* 87 (1): 454–486.

Thachil, Tariq. 2017. "Do Rural Migrants Divide Ethnically in the City? Evidence from an Ethnographic Experiment in India." *American Journal of Political Science* 61 (4): 908–926.

Trotter, Joe. 2015. "The Dynamics of Race and Ethnicity in the U.S. Coal Industry." *International Review of Social History* 60 (S1): 145–164.

U.S. Bureau of the Census. 1975. *Historical Statistics of the United States: Colonial Times to 1970, Bicentennial Edition*. Washington: U.S. Government Printing Office.

Walter, Stefanie. 2010. "Globalization and the Welfare State: Testing the Microfoundations of the Compensation Hypothesis." *International Studies Quarterly* 54 (2): 403–426.

Wilkerson, Isabel. 2010. *The Warmth of Other Suns: The Epic Story of America's Great Migration*. New York: Vintage.

Wilkinson, Steven I. 2004. *Votes and Violence: Electoral Competition and Ethnic Riots in India*. New York: Cambridge University Press.

Group Ties amid Industrial Change: Historical Evidence from the Fossil Fuel Industry
Online Appendices

A. Census Data and Group Measurement

Identifying ethnic groups using U.S. census data is not a straightforward task. Immigrant groups may be defined according to individuals' birthplaces or language. But because of changing national borders in Europe and revisions to enumerator instructions in the early 20th century, countries of birth were often defined differently year to year. Relying on country of birth is also not appropriate for ethnically diverse countries. Reliable language information is additionally not available for all immigrants.

To limit these issues, I define immigrant groups according to both birthplace and language. I primarily classify immigrants according to birthplace (`BPL` and `BPLD` in IPUMS USA data) but use information on their mother tongues (`MTONGUE` and `MTONGUED`) to distinguish between ethnic groups from more diverse countries and correct for changes in birthplace definitions over time (e.g., all immigrants listing Polish as their mother tongue are classified as Polish immigrants regardless of birthplace). When birthplace and language information conflict, language is prioritized. The following is a list of the immigrant groups included and the coding process for each, as well as the number of matched immigrants classified into each group.

1. Danish: birthplace (7,006 matched immigrants)
2. Finnish: birthplace (2,277)
3. Icelandic: birthplace (5)
4. Norwegian: birthplace (13,147)
5. Swedish: birthplace (50,853)
6. English: birthplace (103,516)
7. Scottish: birthplace (34,782)
8. Welsh: birthplace (33,975)
9. Irish: birthplace (66,405)
10. Belgian: birthplace (6,695)
11. French: birthplace (8,911)
12. Luxembourgish: birthplace (62)
13. Dutch: birthplace (3,697)
14. Swiss: birthplace or mother tongue listed as "Swiss" (12,120)
15. Greek: birthplace (457)
16. Italian: birthplace (38,173)
17. Portuguese: birthplace (192)
18. Spanish: birthplace (151)
19. Austrian: birthplace or mother tongue listed as "Austrian" (52,852)
20. Bulgarian: birthplace or mother tongue listed as "Bulgarian" (52)
21. Czechoslovak: birthplace; Czech if mother tongue listed as "Czech," Slovak if mother tongue listed as "Slovak" (1,622)
22. German: birthplace or mother tongue listed as "German" (201,228)
23. Hungarian: birthplace or mother tongue listed as "Magyar, Hungarian" (21,487)
24. Polish: birthplace or mother tongue listed as "Polish" (7,829)
25. Rumanian: birthplace or mother tongue listed as "Rumanian" (729)
26. Croatian: birthplace or mother tongue listed as "Croatian" (60)
27. Dalmatian, Montenegrin: mother tongue listed as either "Dalmatian" or "Montenegrin" (0)
28. Serbian: birthplace or mother tongue listed as "Serbian" (29)
29. Slovenian: birthplace or mother tongue listed as "Slovene" (52)
30. Estonian: birthplace (0)
31. Latvian: birthplace (0)
32. Lithuanian: birthplace or mother tongue listed as "Lithuanian" (215)
33. Russian: birthplace (Russian Empire, excluding Baltic states, Armenia, Ukraine) or mother tongue listed as "Russian" (30,228)
34. Ukrainian: birthplace or mother tongue listed as "Ukrainian" (1)
35. Armenian: birthplace or mother tongue listed as "Armenian" (1)
36. Jewish: mother tongue listed as "Yiddish, Jewish" or "Hebrew, Israeli" (0)

A.1. Association between Group Concentration and Future Changes in Coal Production

My identifying assumption is that groups within the same county did not vary in their concentration in local mines according to future production changes in those mines. To test this, I regress shocks to county coal mines on group-specific concentrations in those mines (interaction of county-level group concentrations with group fixed effects).

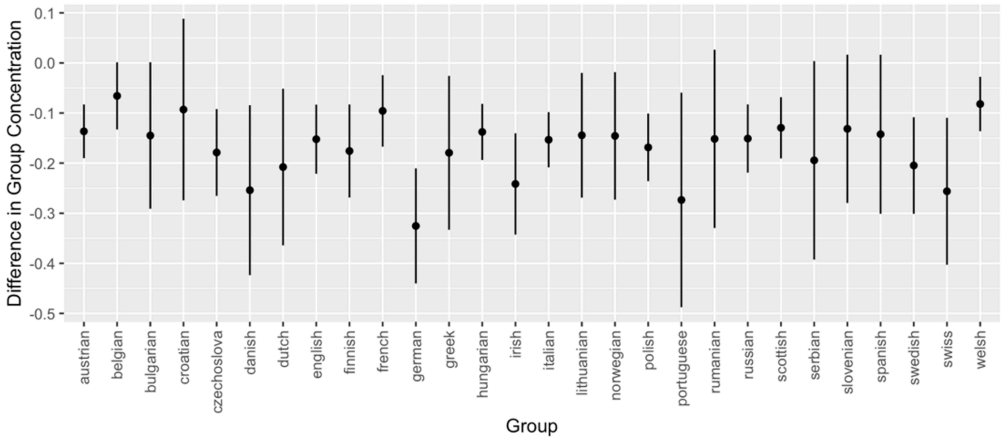

Figure A1: Regression of shocks to county coal (shock intensity measure) on group-specific concentrations in those mines. Coefficients on group concentration variable plotted with 95% confidence intervals.

Figure A1 indicates that while groups were generally less concentrated in coal mines on the precipice of decline, this tendency was consistent across groups — note the similar coefficient magnitudes and overlapping confidence intervals. There is little evidence that some groups sorted into or out of coal more than others according to future shock to the local mines. Within-county comparisons (regressions with county fixed effects) across groups should accordingly be valid.

B. Coal Data and Production Measurement

All coal mine data are collected from editions of *Mineral Resources of the United States*, which was regularly published by the U.S. Geological Survey between 1882 and 1931 (annually between 1900 and 1931) and is now available through the HathiTrust Digital Library. Because the quality of these records is not sufficient for OCR transcription, I transcribed all data manually.

These documents contain information on the amount of coal produced, value of coal produced, mine employment, and mine working days at the county-year level. I collected production data for all available years between 1900 and 1929. In most cases, the reports list these data for individual counties. But there are some cases where counties are aggregated together for particular years owing to relatively low levels of production in some of these counties. Because I do not have information on the breakdown of production across combined counties, I exclude these observations from all analyses. As noted in the main text, I also exclude observations for counties that changed borders in a given decade; I use data from Horan and Hargis, 1995, "County Longitudinal Template, 1840–1990," ICPSR.

To measure industrial shocks, I focus on the quantity of coal produced. The per-unit value of coal produced often did not change much year to year. I do not use employment data either, as coal mines at this time featured large numbers of informal workers not included in official employment statistics. Though data on working days bypasses this issue of informal employment, this variable does not provide information on the amount of work being done on any given day.

For county-years in which no production information is listed, I assume that there was no active production (i.e., production recorded as zero in the dataset). The one exception is for anthracite mines in northeastern Penn-

sylvania. Between 1916 and 1921, these reports did not include county- level information on mining in these areas; data was aggregated up to the coalfield level, which covered multiple counties. In these cases, production is recorded as missing (NA); these observations are then excluded.

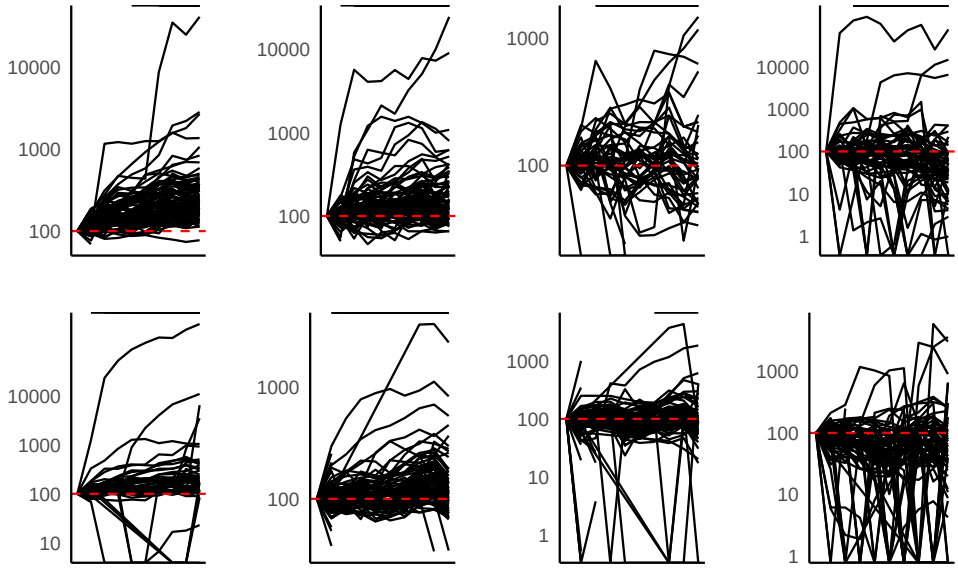

Figure B1: Yearly coal production by county, indexed to production at start of decade (= 100). Divided according to *decade* (1900s- top, 1910s- bottom) and *quartile of shock intensity* (low- left, high- right).

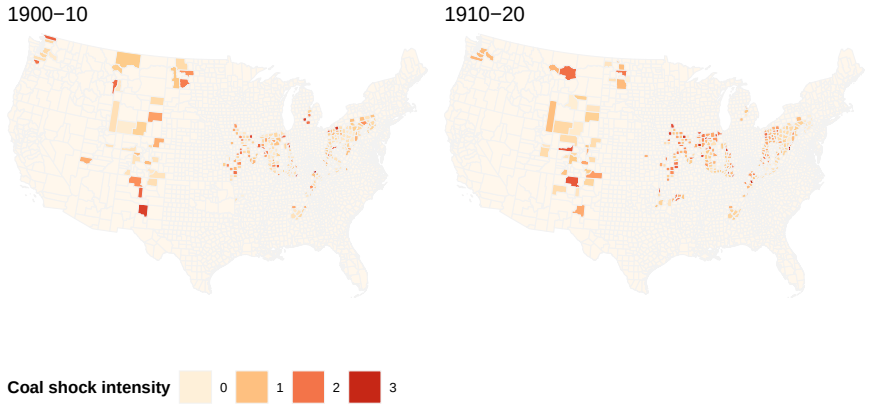

Figure B2: Map of shock intensity by county and decade.

"Shock intensity" is the sum of all year-over-year percentage declines in a given county-decade (i.e., the sum of year-over-year percentage changes, limited to decline years). Decades are defined as the year one census was enumerated until the year before the next census was enumerated (e.g., 1900 through 1909); this is because censuses were enumerated early in the year. I opt for this measure to separate counties that witnessed severe intra-decade production declines from counties with consistently growing coal mines — the key conceptual distinction described in the theory. As shown in Figure B1, counties with low "shock intensities" experienced consistent growth over the course of a given decade. Counties with high "shock intensities" experienced either absolute declines in production during a decade or sharp negative shocks.

C. Additional Calculation Details

C.1. Estimated Income from Wages

Income information was not collected prior to the 1940 census. I accordingly use data from that census (`INCWAGE` in IPUMS) to estimate individuals' pre-tax income from wages and salary. Limiting the 1940 census to all non-agricultural workers, I calculate the median income for every permutation of state of residence, occupation, birthplace, race, and sex, which I then apply to individuals in earlier censuses. This approach is based on what scholars have done previously (e.g., Abramitzky et al., 2021, "Intergenerational Mobility of Immigrants in the United States over Two Centuries," *American Economic Review*.).

C.2. Bartik Estimate of Non-Coal Shocks

I record for each county, at the start of each decade, the proportion of workers employed in each of six major industry categories: durable goods manufacturing, non-durable goods manufacturing, agriculture, petroleum and natural gas extraction, metallic mining, and non-metallic mining (note the exclusion of coal mining). I identified workers in each industry category using `IND1950` classifications in IPUMS datasets. I then draw on annual national production data for each industry category, gathering this from U.S. Bureau of the Census (1975). Due to its availability each year, I use data on the value of production for each industry category; for agriculture, I use a wholesale price index. For each industry category, I compute the same "shock intensity" measure as I did for coal. I then calculate a weighted average across these categories using counties' initial employment shares, taking the square root due to a rightward skew.

C.3. Congressional Election Data

I collected Democratic and Republican congressional vote share data from Clubb, Flanigan, and Zingale, 2006, "Electoral Data for Counties in the United States: Presidential and Congressional Races, 1840–1972," ICPSR. Republican strongholds are those where the Republican vote share exceeded the Democratic share by at least 12.6 points (median difference in sample).

C.4. Observation Weights

I estimate a probit model to predict individuals' probabilities of being matched as a function of their age, sex, literacy, urban or rural residence, immigrant status, and occupational prestige. This follows the recommendation of Abramitzky, Boustan, and Rashid, 2020, "Census Linking Project: Version 1.0 [dataset]." Occupational prestige reflects occupation-specific incomes in 1950 (`OCCSCORE` in IPUMS USA data). Following Abramitzky, Boustan, and Rashid, the age variable is collapsed into ten bins (0–9, 10–19, ..., 90–) and the occupation variable is collapsed into six bins (0–9, 10–19, ..., 50–). Weights are calculated according to the first year of a given range (e.g., 1900 for 1900–10). The following describes the weight calculation for individual i and matching range t:

$$\text{weight}_{it} = \frac{1 - \text{predicted probability of having been matched}_{it}}{\text{predicted probability of having been matched}_{it}} \times \frac{\%\,\text{matched}_t}{1 - \%\,\text{matched}_t}$$

D. Summary Statistics and Information on Matched Immigrants

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Group concentration	698,546	0.242	0.266	0.000	0.022	0.441	1.000
Coal shock intensity	698,809	0.648	0.480	0.000	0.279	0.875	3.332
General shock intensity (Bartik)	698,809	0.007	0.003	0.002	0.006	0.009	0.026
Naturalized (outcome)	698,809	0.647	0.478	0	0	1	1
Marriage to white citizen (outcome)	698,809	0.086	0.281	0	0	0	1
Marriage to non-coethnic immig. (outcome)	698,809	0.213	0.409	0	0	0	1
Speaks English (outcome)	684,337	0.925	0.264	0.000	1.000	1.000	1.000
Immigration year	698,809	1,883.110	14.400	1,815	1,874	1,892	1,910
Income from employment	296,065	1,160.914	495.469	20.000	839.500	1,450.000	50,000.000
Male	698,809	0.570	0.495	0	0	1	1
Living with spouse	698,809	0.851	0.356	0	1	1	1
Living with family in coal	698,809	0.104	0.306	0	0	0	1
Coethnic pop. as % county	698,809	0.032	0.028	0.00000	0.011	0.048	0.217
County coal reliance	698,809	0.136	0.139	0.0002	0.027	0.266	0.599
Rural pop. as % county	698,809	0.491	0.259	0.089	0.219	0.707	1.000
Black pop. as % county	698,809	0.021	0.036	0.000	0.004	0.034	0.404

Table D1: Summary statistics for full dataset. Statistics do not include variable transformations (e.g., square root).

	Matched immigrants	Unmatched immigrants	Immigrants elsewhere
Percentage	29.1%	70.9%	n/a
Age	41.6	41.7	43.0
Female	43.0%	35.8%	44.5%
Can read and write	89.2%	78.0%	87.8%
Rural	46.9%	45.4%	29.9%
Occupational prestige	11.7	13.0	11.4

Table D2: Mean characteristics of matched and unmatched European immigrants in coal counties, compared to European immigrants elsewhere in the country.

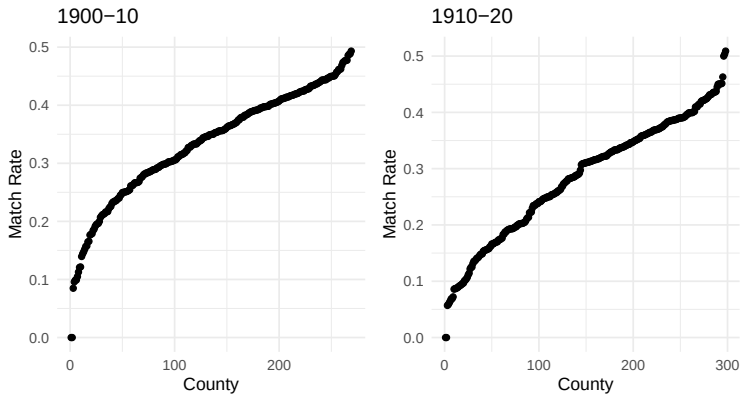

Figure D1: Match rates among European immigrants by county, in ascending order.

In Figure D2, I consider the possibility of immigrants moving back to Europe. One limitation to census linking analyses is that instances of international return migration are not directly observed; only individuals living in the

U.S. during the enumeration of two censuses can be matched. To evaluate this, I test whether the interaction of group concentration and coal shocks predicts whether European immigrants in coal counties were successfully matched to the next census. One reason why individuals are not matched is departure from the country, making this an approximate measure of return migration. While match rates were generally lower for groups more concentrated in coal, I find no evidence that this relationship varied with shocks to local coal mines.

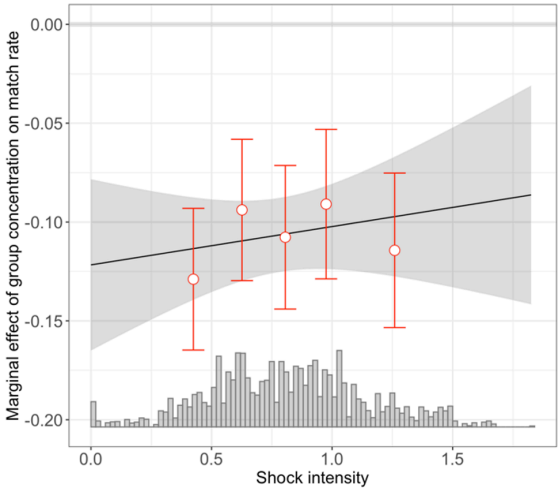

Figure D2: Regression of group match rate (at county-year level) on interaction of group concentration and shock intensity ($n = 7{,}382$). State-year and county fixed effects are included; standard errors are clustered at group-county level. Points indicate results of binned estimation (Hainmueller, Mummolo, and Xu 2019).

E. Regression Tables

	Naturalized	
	Model 1	Model 2
Group concentration	−0.652***	−0.587***
	(0.103)	(0.107)
Coal shock intensity	−0.852***	3.312
	(0.177)	(2.063)
General shock intensity (Bartik)	−6.327***	5.147
	(1.911)	(3.463)
Coethnics as % county		−0.235
		(0.259)
County coal reliance		1.377***
		(0.247)
Rural population as % county		−0.059
		(0.194)
Black population as % county		−0.979*
		(0.569)
Year of emigration		−0.007***
		(0.001)
Estimated income (ln)		0.220***
		(0.038)
Living with spouse		0.053***
		(0.016)
Coal shock × concentration	0.428***	0.487***
	(0.098)	(0.112)
Coal shock × Bartik	7.731***	−5.413*
	(1.734)	(3.121)
Coal shock × coethnic pop.		−0.176
		(0.267)
Coal shock × coal reliance		−1.172***
		(0.294)
Coal shock × rural pop.		0.077
		(0.191)
Coal shock × Black pop.		−0.359
		(0.497)
Coal shock × immig. year		−0.001
		(0.001)
Coal shock × income		−0.041
		(0.043)
Coal shock × spouse		−0.007
		(0.020)
Counties	311	298
N	75056	59503
Adj. R-squared	0.122	0.170

***p < .01; **p < .05; *p < .1

	Naturalized
Group concentration	−0.343***
	(0.073)
Coal shock intensity	−0.105**
	(0.043)
General shock intensity (Bartik)	1.543
	(1.936)
Coal shock × concentration	0.190***
	(0.074)
Group as % county × (1900–10)	0.122
	(0.153)
Group as % county × (1910–20)	−0.474***
	(0.092)
Coal reliance × (1900–10)	0.603***
	(0.165)
Coal reliance × (1910–20)	0.730***
	(0.142)
Rural pop. × (1900–10)	0.037
	(0.131)
Rural pop. × (1910–20)	−0.092
	(0.125)
Black pop. × (1900–10)	−1.343***
	(0.496)
Black pop. × (1910–20)	−1.323***
	(0.491)
Immig. year × (1900–10)	−0.008***
	(0.0004)
Immig. year × (1910–20)	−0.008***
	(0.0004)
Income × (1900–10)	0.100***
	(0.018)
Income × (1910–20)	0.230***
	(0.016)
w/ spouse × (1900–10)	0.095***
	(0.014)
w/ spouse × (1910–20)	0.032***
	(0.006)
N	59503
Adj. R-squared	0.171

***p < .01; **p < .05; *p < .1

Table E1: *Left-* Full regression table, corresponding to Figure 3 in the main text. *Right-* Replication of main regression analysis, interacting beginning-of-period covariates with year fixed effects.

	Naturalized	
	High exposure	Low exposure
Coal shock intensity	0.058**	0.010
	(0.027)	(0.022)
General shock intensity (Bartik)	0.520	−1.661***
	(1.170)	(0.618)
Year of emigration	−0.008***	−0.008***
	(0.0004)	(0.001)
Estimated income (ln)	0.191***	0.213***
	(0.017)	(0.037)
Living with spouse	0.043***	0.050***
	(0.006)	(0.008)
Coethnics as % county	−0.704***	−0.100
	(0.096)	(0.075)
County coal reliance	0.287**	0.046
	(0.117)	(0.062)
Rural population as % county	−0.161***	−0.032
	(0.053)	(0.042)
Black population as % county	−0.162	−0.349**
	(0.115)	(0.166)
N	32561	26942
Adj. R-squared	0.124	0.195

***p < .01; **p < .05; *p < .1

Table E2: Models regressing naturalization on coal shock intensity, differentiating immigrants with high group exposure (at least the median of 22.7%) from those with low exposure (below 22.7%). State-year fixed effects, errors clustered by county.

	Naturalized			
	Immigrant miners		Coal-adjacent immigrants	
	Model 1	Model 2	Model 3	Model 4
Group concentration	−0.833***	−0.789***	−0.764***	−0.751***
	(0.137)	(0.146)	(0.166)	(0.158)
Coal shock intensity	−0.717***	10.112***	−1.350***	1.065
	(0.204)	(3.564)	(0.262)	(2.480)
General shock intensity (Bartik)	−6.049***	10.302*	−10.653***	3.129
	(2.122)	(5.385)	(2.915)	(3.923)
Coethnics as % county		−0.459		0.158
		(0.313)		(0.362)
County coal reliance		1.607***		1.538***
		(0.347)		(0.294)
Rural population as % county		−0.467*		−0.061
		(0.243)		(0.227)
Black population as % county		−1.445*		−1.150
		(0.794)		(0.735)
Year of emigration		−0.005***		−0.008***
		(0.001)		(0.001)
Estimated income (ln)		0.053		0.302***
		(0.089)		(0.048)
Living with spouse		0.094***		0.042**
		(0.021)		(0.020)
Coal shock × concentration	0.536***	0.599***	0.679***	0.678***
	(0.151)	(0.170)	(0.153)	(0.162)
Coal shock × Bartik	3.333*	−11.490***	12.580***	−1.293
	(1.928)	(4.421)	(2.495)	(3.698)
Coal shock × coethnic pop.		0.079		−0.543
		(0.421)		(0.348)
Coal shock × coal reliance		−1.730***		−0.959***
		(0.382)		(0.354)
Coal shock × rural pop.		0.394		0.147
		(0.291)		(0.213)
Coal shock × Black pop.		0.614		−0.347
		(0.655)		(0.603)
Coal shock × immig. year		−0.005***		−0.0001
		(0.002)		(0.001)
Coal shock × income		0.062		−0.110**
		(0.108)		(0.052)
Coal shock × spouse		−0.079**		0.014
		(0.031)		(0.026)
N	23415	23374	50552	35503
Adj. R-squared	0.106	0.132	0.120	0.186

***p < .01; **p < .05; *p < .1

	Naturalized			
	More competitive		Republican stronghold	
	Model 1	Model 2	Model 3	Model 4
Group concentration	−0.792***	−0.612***	−0.604***	−0.491***
	(0.099)	(0.112)	(0.178)	(0.145)
Coal shock intensity	−1.254***	6.772***	−0.062	0.160
	(0.254)	(2.571)	(0.739)	(3.430)
General shock intensity (Bartik)	−5.486*	−1.080	−1.227	14.613*
	(3.247)	(6.455)	(6.990)	(8.879)
Coethnics as % county		−0.290		−0.163
		(0.283)		(0.455)
County coal reliance		0.947**		1.847***
		(0.427)		(0.432)
Rural population as % county		−0.152		0.002
		(0.351)		(0.413)
Black population as % county		0.271		−1.960
		(0.898)		(1.457)
Year of emigration		−0.005***		−0.009***
		(0.001)		(0.002)
Estimated income (ln)		0.220***		0.214***
		(0.046)		(0.059)
Living with spouse		0.024		0.101***
		(0.021)		(0.024)
Coal shock × concentration	0.689***	0.615***	0.200	0.236
	(0.112)	(0.131)	(0.162)	(0.152)
Coal shock × Bartik	10.778***	3.157	−1.535	−19.478**
	(2.578)	(5.671)	(7.241)	(8.291)
Coal shock × coethnic pop.		−0.155		−0.272
		(0.325)		(0.459)
Coal shock × coal reliance		−0.761		−1.624***
		(0.510)		(0.522)
Coal shock × rural pop.		−0.164		0.131
		(0.316)		(0.430)
Coal shock × Black pop.		−0.938		−1.264
		(0.634)		(1.326)
Coal shock × immig. year		−0.003***		0.001
		(0.001)		(0.002)
Coal shock × income		−0.058		−0.002
		(0.054)		(0.061)
Coal shock × spouse		0.037		−0.075**
		(0.026)		(0.033)
N	33942	27060	37402	29747
Adj. R-squared	0.129	0.177	0.115	0.162

***p < .01; **p < .05; *p < .1

Table E3: *Left-* Full regression table, corresponding to Figure 4 in the main text. *Right-* Full regression table, corresponding to Figure 5 in the main text.

	Central Appalachia + West		Naturalized Elsewhere		Elsewhere (matched n)
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Group concentration	−0.230	−0.299*	−0.714***	−0.612***	−0.758***
	(0.199)	(0.166)	(0.114)	(0.119)	(0.248)
Coal shock intensity	0.509	−5.169	−0.958***	3.649*	12.116**
	(0.354)	(7.841)	(0.192)	(2.138)	(5.932)
General shock intensity (Bartik)	5.612	1.783	−7.585***	4.618	12.899
	(3.783)	(5.170)	(2.142)	(4.398)	(8.713)
Year of emigration		−0.010***		−0.007***	−0.003
		(0.003)		(0.001)	(0.003)
Estimated income (ln)		0.202**		0.220***	0.085
		(0.100)		(0.040)	(0.114)
Living with spouse		0.070		0.051***	0.041
		(0.046)		(0.016)	(0.048)
Coethnics as % county		−0.157		−0.235	−0.406
		(0.633)		(0.269)	(0.412)
County coal reliance		0.507		1.372***	1.600***
		(0.538)		(0.295)	(0.592)
Rural population as % county		0.527		−0.062	−0.363
		(0.427)		(0.213)	(0.452)
Black population as % county		0.036		−1.186*	−3.866***
		(1.081)		(0.668)	(1.349)
Coal shock × concentration	−0.079	0.090	0.496***	0.527***	0.703***
	(0.221)	(0.212)	(0.108)	(0.123)	(0.265)
Coal shock × Bartik	−2.801	3.324	8.520***	−5.219	−16.623**
	(3.730)	(6.733)	(1.879)	(3.738)	(7.238)
Coal shock × immig. year		0.003		−0.001	−0.006*
		(0.004)		(0.001)	(0.003)
Coal shock × income		−0.042		−0.040	0.069
		(0.116)		(0.045)	(0.138)
Coal shock × spouse		−0.035		−0.004	0.013
		(0.058)		(0.022)	(0.065)
Coal shock × coethnic pop.		−0.079		−0.197	−0.037
		(0.794)		(0.276)	(0.431)
Coal shock × coal reliance		0.177		−1.191***	−1.888***
		(0.704)		(0.347)	(0.659)
Coal shock × rural pop.		−0.647		0.078	0.073
		(0.430)		(0.218)	(0.432)
Coal shock × Black pop.		0.304		−0.401	−0.829
		(1.049)		(0.550)	(1.195)
N	7736	5494	67320	54009	6144
Adj. R-squared	0.135	0.175	0.121	0.169	0.154

***p < .01; **p < .05; *p < .1

Table E4: Full regression table, corresponding to Figure 6 in the main text. **NB:** One challenge with these analyses is that the sample size for the Central Appalachian and Western coal areas is substantially smaller than that for other areas. To evaluate whether the null is due to a lack of statistical power, I draw a random sample of the non-Appalachian/Western observations to approximate the sample size of the Appalachian/Western tests (Model 5). Significant results are still found for non-Appalachian/Western areas with this deflated sample, indicating that the null for Central Appalachia/West is not simply due to a lack of statistical power.

	Naturalized			
	More coethnic coworkers		Fewer coethnic coworkers	
	Model 1	**Model 2**	**Model 3**	**Model 4**
Group concentration	−1.451***	−1.220***	−0.277**	−0.209
	(0.290)	(0.189)	(0.109)	(0.139)
Coal shock intensity	−2.459***	0.835	−0.578***	1.495
	(0.482)	(3.543)	(0.199)	(2.860)
General shock intensity (Bartik)	−15.967***	5.499	−5.568**	−10.378*
	(4.757)	(4.828)	(2.530)	(5.786)
Year of emigration		0.697		−0.264
		(0.431)		(0.371)
Estimated income (ln)		1.918***		0.431
		(0.405)		(0.344)
Living with spouse		−0.041		0.275
		(0.279)		(0.304)
Coethnics as % county		−1.000		−0.825
		(1.019)		(0.911)
County coal reliance		−0.008***		−0.007***
		(0.002)		(0.001)
Rural population as % county		0.372***		0.165***
		(0.064)		(0.050)
Black population as % county		0.045**		0.031
		(0.019)		(0.037)
Coal shock × concentration	1.292***	1.102***	0.193*	0.162
	(0.272)	(0.194)	(0.110)	(0.152)
Coal shock × Bartik	22.200***	−0.945	6.191***	7.748
	(4.605)	(5.165)	(1.983)	(5.068)
Coal shock × immig. year		−0.684*		−0.239
		(0.412)		(0.397)
Coal shock × income		−1.250***		0.017
		(0.472)		(0.428)
Coal shock × spouse		0.218		−0.478
		(0.271)		(0.298)
Coal shock × coethnic pop.		0.026		−0.708
		(0.905)		(0.613)
Coal shock × coal reliance		0.0002		−0.001
		(0.002)		(0.002)
Coal shock × rural pop.		−0.170**		−0.006
		(0.068)		(0.057)
Coal shock × Black pop.		0.009		0.015
		(0.027)		(0.044)
N	25260	21840	25292	13663
Adj. R-squared	0.169	0.215	0.079	0.131

***p < .01; **p < .05; *p < .1

Table E5: Full regression table, corresponding to Figure 7 in the main text.

F. Social Assimilation

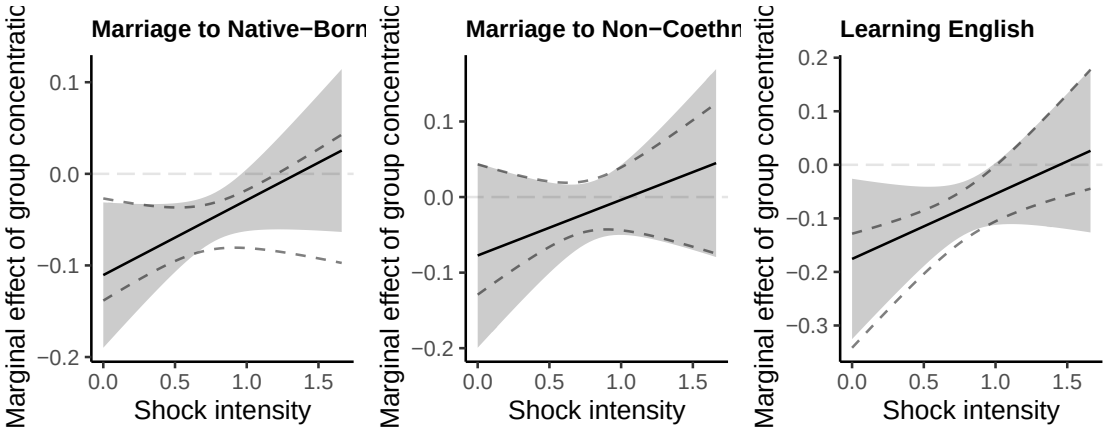

Figure F1: Interaction plots for marriage to native-born white citizen (left), marriage to a non-coethnic immigrant (center), and learning English (right) outcomes. Note that the income covariate is excluded from these tests due to limited availability for immigrant women.

G. Additional Tests

G.1. Long-Term vs. Recent Immigrants

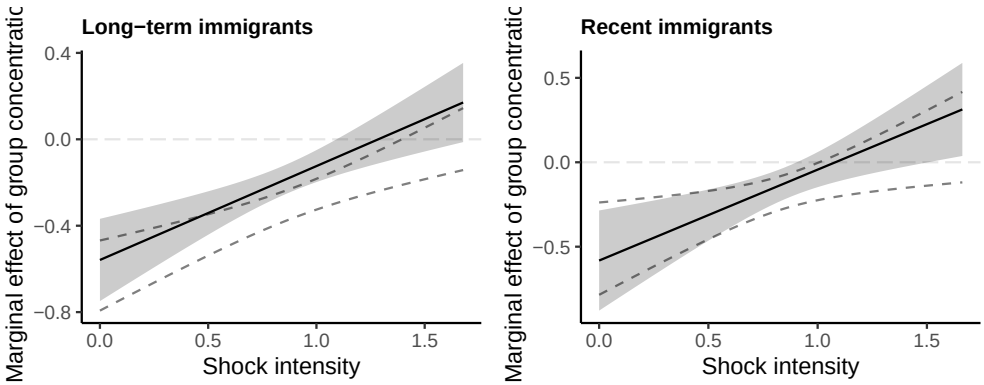

Figure G1: Interaction of group concentration and shock intensity on naturalization. Recent immigrants first arrived in the U.S. within five years of census enumeration; long-term immigrants arrived earlier.

G.2. Entry of Coal-Adjacent Immigrants into Coal

In these tests, I consider the possibility of coal-adjacent immigrants entering the coal industry during a given decade. I first limit the sample of coal-adjacent immigrants to those of at least 41 years of age, who would have been older than 75% of all coal miners upon entering the industry. I then limit the sample to coal-adjacent immigrants still not working in coal at the end of a decade.

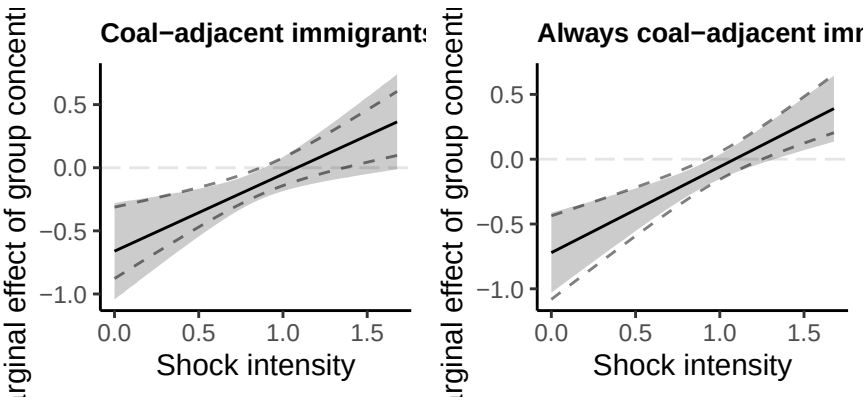

Figure G2: *Left-* Interaction of group concentration and shock intensity on naturalization, limited to coal- adjacent immigrants of at least 41 years of age (n = 14,950). *Right-* Interaction of group concentration and shock intensity on naturalization, limited to coal-adjacent immigrants still not working in coal at end of decade (n = 45,731).

G.3. Leading Economic Conditions (Placebo Test)

	Naturalized
Group concentration	−0.819***
	(0.151)
Coal shock intensity	−0.734***
	(0.189)
General shock intensity (Bartik)	−2.180
	(2.388)
Coal shock intensity (LEADING)	0.197*
	(0.115)
General shock intensity (LEADING)	−0.281
	(1.122)
Coal shock × concentration	0.429***
	(0.112)
Coal shock × Bartik	8.088***
	(1.778)
Concentration × coal shock (LEADING)	0.145
	(0.104)
Coal shock (LEADING) × Bartik (LEADING)	−1.099*
	(0.662)
N	72676
Adj. R-squared	0.124

***p < .01; **p < .05; *p < .1

Table G1: Regressions on naturalization. Includes standard shock variables, alongside *leading* shock indicators (shock in the forthcoming decade; e.g., shocks between 1920–1929 for immigrants matched from 1910–1919). Null results are expected and found for these leading indicators in interaction with group concentration. Significant results remain for the standard shock variables.

G.4. Growth Measures

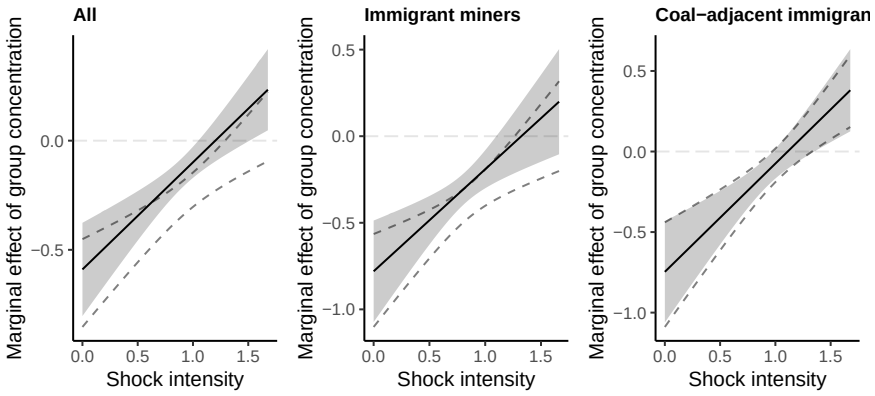

Figure G3: Baseline models, including additional controls for (a) coal and Bartik growth (sum of year-over-year percentage increases) and (b) the sum of absolute percentage changes in coal production and Bartik-estimated production.

G.5. Rail-Connected Counties

For this test, group concentration and shock intensity (both coal and general) are calculated by aggregating all counties to which a given immigrant's county had a direct railroad connection (excluding that origin county). I gathered historical railroad shapefiles from Atack, 2016, "Historical Geographic Information Systems (GIS) database of U.S. Railroads for 1899 and 1909." I isolated all railroads in operation by 1899 or 1909 and identified those that traversed coal-producing counties in 1900 or 1910 respectively. I approximate the most direct rail connections by identifying the coal-producing counties that were on the same rail line (same railroad name in the Atack data).

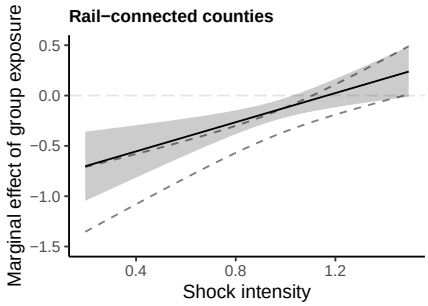

Figure G4: Interaction of rail-connected group concentration and shock intensity on naturalization.

G.6. *Declarations of Intention to Nature*

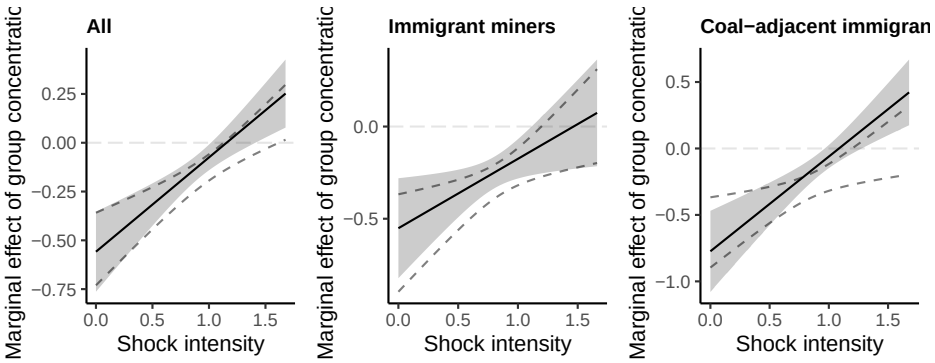

Figure G5: Interaction of group concentration and shock intensity on declarations of intention to naturalize. This is a less precise indicator of political assimilation as many immigrants who declared an intent to naturalize ultimately did not do so.

G.7. *Clustering Standard Errors at County Level*

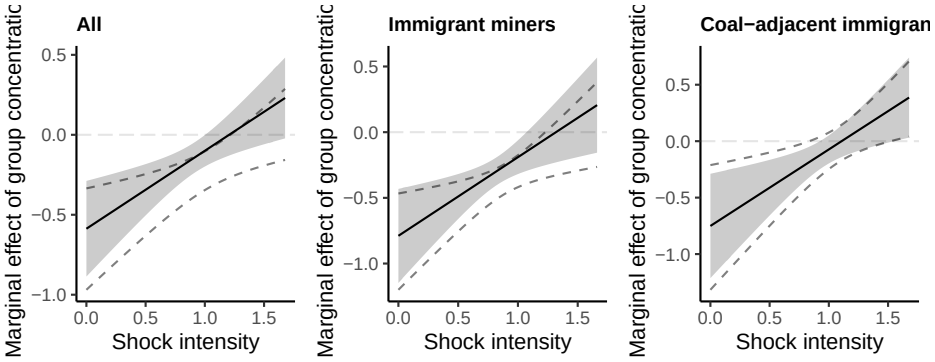

Figure G6: Interaction of group concentration and shock intensity on naturalization. Standard errors clustered by county.

G.8. *Binned Estimator Results for Main Tests*

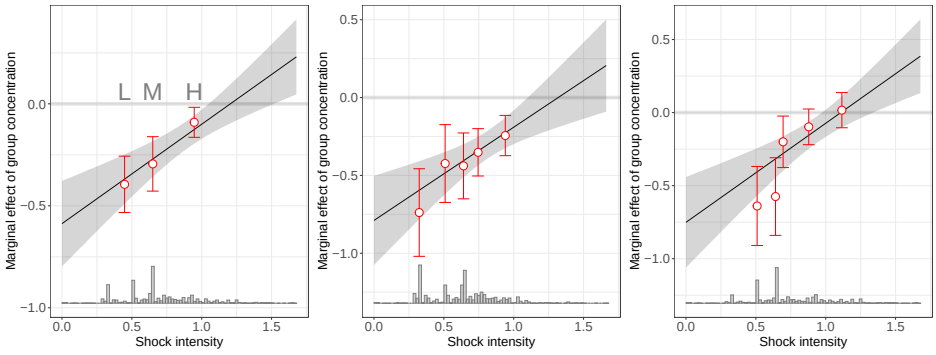

Figure G7: *L*- baseline; *C*- immigrant miners; *R*- coal-adjacent. By calculating coefficients by quantile (tercile for baseline tests; quintile for subsamples), this estimator avoids issues of linear extrapolation to parts of the domain without common support in the moderator (Hainmueller, Mummolo, and Xu 2019). Quantile estimates affirm main returns, mirroring pattern found using the traditional linear estimator approach. Differences between highest/lowest quantile coefficient are statistically significant at the $\alpha = 0.05$ level for each test.

G.9. Iteratively Dropping Sets of Observations

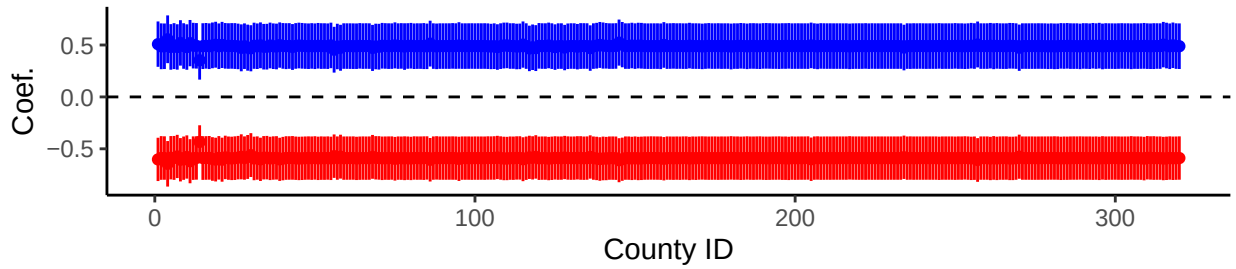

Figure G8: Replications of main model of interaction of group concentration and shock intensity on naturalization, including all covariates. Each replication drops a **single county** from the dataset to check for the presence of highly influential outlier counties. Coefficients and 95% confidence intervals are plotted for the interaction of group concentration and shock intensity (top) and group concentration main effect (bottom).

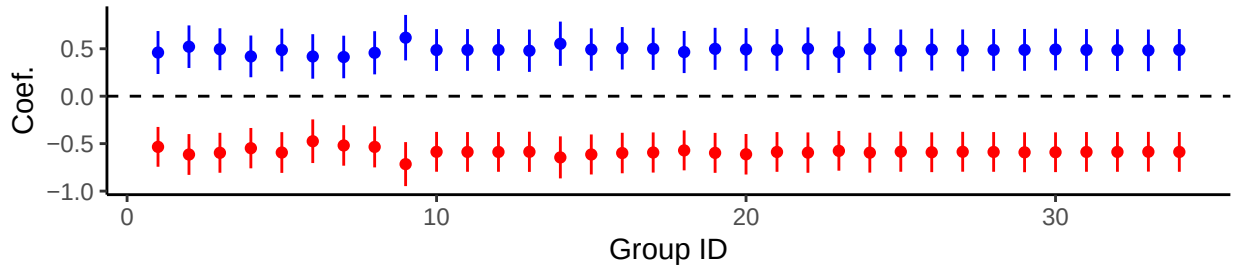

Figure G9: Replications of main model of interaction of group concentration and shock intensity on naturalization, including all covariates. Each replication drops a **single ethnic group** from the dataset to check for the presence of highly influential outlier groups. Coefficients and 95% confidence intervals are plotted for the interaction of group concentration and shock intensity (top) and group concentration main effect (bottom).

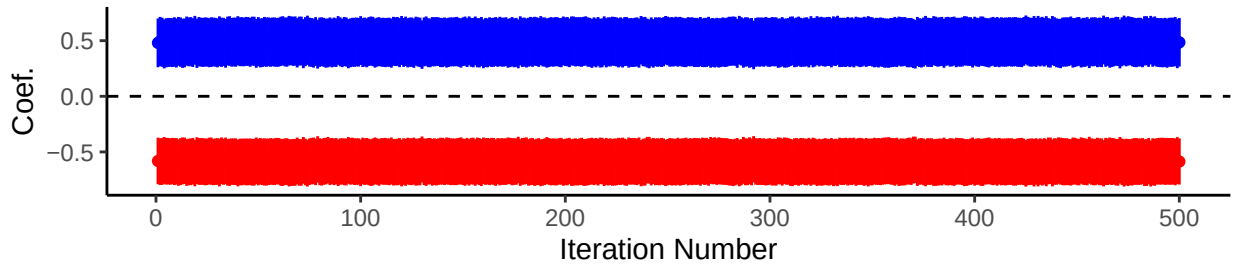

Figure G10: Replications of main model of interaction of group concentration and shock intensity on naturalization, including all covariates. Each replication randomly drops **1% of all observations** to check for highly influential outliers (similar to the suggestion of Broderick, Giordano, and Meager, "An Automatic Finite-Sample Robustness Metric," <arxiv.org/abs/2011.14999>). Coefficients and 95% confidence intervals are plotted for the interaction of group concentration and shock intensity (top) and group concentration main effect (bottom).