DISSERTATION

INSTITUTIONS AND STRUCTURAL TRANSFORMATIONS IN THE NORTH AMERICAN ECONOMY

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ABSTRACT

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IN THE NORTH AMERICAN ECONOMY

It is often asserted that secure property rights and legal frameworks conducive to the functioning of markets are essential institutional foundations of a capitalist economy. It is sometimes even claimed that they are preconditions of economic growth. Efforts to implement those institutions have, however, produced heterogeneous outcomes for different groups of people. This dissertation considers the effects of two waves of institutional change in North America: the nineteenth-century privatization and subsequent alienation of communal property in the United States and Mexico and the late-twentieth-century neoliberal reforms in Mexico. Both episodes contributed to profound structural transformations in the North American economy. In the process of shaping important aspects of the present capitalist economies of Mexico and the United States, the above-mentioned institutional changes resulted in land loss, dispossession, the destruction of traditional livelihoods and, for many people, insertion into labor markets on the lowest rungs, with reduced autonomy, and with little or no job security.

The dissertation examines three cases of communal property privatization. First, it considers the effect of the 1887 Dawes General Allotment Act on American Indian migration using data from the 1930 U.S. Census. The results suggest that individuals who were likely to have lost land due to allotment had a higher propensity to migrate to cities and to other states. Second, historical literature is reviewed to understand how the privatization of communal property under Mexico's 1856 Lerdo Law exacerbated land loss and inequality. That episode

inspired subsequent efforts to reverse the effects of privatization through the creation of a new form of communal property known as *ejidos* during and after the Mexican Revolution. Third, the consequences of 1992 constitutional reforms allowing the privatization of *ejidos* are considered. The main finding is that municipalities with larger relative declines in *ejido* and agrarian community membership (as a percentage of population) and more land sales to non-*ejido*-members experienced larger increases in income inequality.

Mexico's 1992 *ejido* reforms were part of a broader set of neoliberal reforms aimed at seamlessly integrating the country into the North American and global economies. Trade and investment regulations were liberalized, which contributed to the spread of cross-border production sharing or "offshoring" arrangements in the manufacturing sector. The last section of the dissertation considers the effects of those arrangements on employment volatility. The main finding is that reliance on offshoring-related revenues generally had a large, positive impact on manufacturing-sector employment volatility in Mexico over the 2007 to 2020 period. In contrast, trade that was not related to offshoring had, at most, a weak impact on volatility. The main policy implication is that attracting jobs in the labor-intensive stages of transnational manufacturing production processes may entail the risk of increasing employment volatility.

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TABLE OF CONTENTS

Chapter 1: Private Property, Dispossession, and Primitive Accumulation

This dissertation concerns two interlocking themes. First, it considers the effects of policies aimed at privatizing communal land in the United States and Mexico. Second, it examines the impacts of cross-border production sharing linkages, which transformed Mexico's manufacturing industries after the liberalization of trade and investment. Both the privatization of communal property and policies promoting cross-border production sharing contributed to major overhauls of North America's institutional architecture. Though hailed by some as signs of progress, they conditioned structural transformations and economic growth in ways that often undermined economic autonomy and security for vulnerable populations.

In the United States, the 1887 Dawes Act aimed to privatize communally held Indigenous land through a process known as allotment. It also aimed to assimilate Indians and open up land to White settlement (McDonnell, 1991; Carlson, 1981). Chapter 2 shows how allotment was associated with early episodes of Indian outmigration from rural areas and transitions from self-employment to wage labor. Mexico also experimented with the privatization of communal land under the Lerdo Law of 1856 and again with constitutional reforms in 1992. The first of those institutional changes was infamously associated with mass dispossession and unprecedented inequality by the eve of the Mexican Revolution (Molina Enríquez, 1909). Chapter 3 shows how the post-1992 privatization of a form of communal property known as *ejidos* also increased inequality in Mexico, though on a much smaller scale. Like similar institutional changes in the United States, the 1992 reforms led to significant outmigration from the countryside (Valsecchi, 2014; de Janvry et al., 2015). Some rural migrants found work in the growing hubs of Mexico's cross-border production sharing industries, typically located near the northern border. Chapter 4

shows that employment in those industries is especially prone to boom-and-bust cycles. That may help explain why Mexico's manufacturing sector has not been a reliable engine for national prosperity in the neoliberal period (Cypher and Delgado Wise, 2010; Palma, 2005).

The privatization of communal property and the growth of manufacturing are connected via the concept of primitive accumulation, which Marx (1990, p. 875) defined as "the historical process of divorcing the producer from the means of production." In the case of England, which Marx studied in depth, the separation of producers from the land was accelerated by the enclosure of the commons. Peasants, deprived of their land assets, were forced to sell their labor in urban areas to survive, thus fueling the growth of English manufacturing by creating a large reserve of cheap labor (ibid., pp. 877-904). In Marx's view, the flow of workers from agriculture into manufacturing was not simply an automatic response to market incentives, but rather a result of changes in property institutions. By using public policies to make communal landholding and traditional peasant agriculture difficult or impossible, capitalists were able to influence not only the demand for industrial labor, but the supply too (ibid., p. 793).

The chapters on communal property privatization touch on a long-running debate over the relative merits of communal versus private property institutions. Some scholars have contended that private property can improve upon communal property by disincentivizing the overuse of natural resources and reducing transaction costs (Alchian and Demsetz, 1973; Demsetz, 1967). Others argue that institutions of private property encourage investment, which in turn fuels long-run growth (Acemoglu, Johnson, and Robinson, 2002; North, 1990). Marx (1990) acknowledges that the enclosure of the commons in England contributed to economic growth, but he also highlights the coercive nature of the process and its unjust distributional consequences. In the case of North America, these distributional issues are especially relevant

because much of the communal property was held by Indigenous groups and privatization has been associated with attempts to break up Indigenous tribes and communities. Ostrom (1990) criticizes the traditional defense of land privatization from a different angle, arguing that the inefficiency problems cited above can be avoided through appropriate self-governance mechanisms for regulating the commons.

Both the Dawes Act in the United States and the 1992 constitutional reforms in Mexico have been compared to the English enclosure process (Chang, 2011; Cornelius and Myhre, 1998, p. 1). Bartra (1993, p. xiii) further compares the 1992 reforms to the privatization of Indigenous village lands under Mexico's 1856 Lerdo Law. The often coercive implementation of the Lerdo Law, in turn, was remarkably similar to the process of primitive accumulation described by Marx (ibid., 32, 83-85). Completing the chain of analogies, Simpson (1937, p. 25) compares the Lerdo Law to the Dawes Act. It is important to study the history of North American property institutions because it provides insights into the likely outcomes of modern-day attempts to resurrect the Dawes Act and the Lerdo Law under the guise of superficially "new" proposals to increase economic freedom by allocating private property rights to individuals. Throughout North America, the privatization of communal and Indigenous land has resurfaced as a political issue (Bauer, 2021; Pasternak, 2015; Díaz, 2012).

The conversion of Indigenous land into fee-simple private property was not confined to North America. It occurred in many parts of the world in the nineteenth century, including the Andean region and a number of Pacific islands (Chang, 2011; Banner, 2005, p. 259). Linking primitive accumulation with imperialism, Luxemburg (1964, pp. 368-371) argued that the privatization of communal property played an important role in the territorial expansion of capitalism, by ensuring commercial access to colonial land. In that context, she cited nineteenth-

century French legislation that was remarkably similar to the Dawes Act. Its goals were to transform Algerian communal property into private property, break up Arab tribal units, and facilitate the acquisition of Arab-owned land (ibid., pp. 379-385). While this dissertation focuses on North America, the privatization of communal property was a global process.

There are many similarities between U.S. and Mexican efforts to privatize communal property, but it is essential to acknowledge that those experiences were rooted in very different agrarian economies that emerged from distinct colonial histories. Greer (2018, pp. 18, 196) notes that England was unique among the major colonial empires in at least two ways. First, it had a high level of land concentration, which contributed to the divorce of the peasantry from the soil. Second, the focus of its early colonization program was on the quest for "land and roome" rather than control over groups of people. Perhaps these two distinctions are not coincidental, but rather are connected by the fact that the dispossession wrought by British agrarian capitalism generated a surplus population that sought a new home in the colonies (Nichols, 2020, p. 98; Wood, 2003, pp. 85-86). In the process, the English colonists displaced Indigenous peoples to a greater extent than the Spanish or French (ibid., pp. 92-93).

The distinct historical experience of the United States helps explain why private property institutions were more sacrosanct there than in Mexico. Previous literature has suggested that strong support for protections on individual property rights in the United States would not have been possible without broad-based property ownership (Lamoreaux, 2011). In this context it is important to acknowledge that the creation of secure property rights for a large segment of the White population was achieved by making property rights for Indians insecure (Carlos, Feir, and Redish, 2022). A representative government dominated by Whites was often quite permissive of trespassing, squatting, and homesteading on Indian land in the nineteenth century (Banner,

2005). This permissive attitude was supported by a long tradition of legal reasoning to the effect that agriculturalists had the right to expropriate land belonging to hunter-gatherers (Wood, 2003, pp. 74-101; Hagan, 1980). In other words, secure property rights and relatively equal access to economic resources, which Acemoglu, Johnson, and Robinson (2005, p. 395) equate with "good economic institutions," were provided to Whites by dispossessing the Indigenous population. That raises questions about the extent to which those institutions were truly "good."

In Mexico, in contrast, Indigenous communal property formed an integral and very important part of the colonial system of land rights (Castro, 2010, pp. 90-92). Although the 1856 Lerdo Law was intended to spread U.S.-style private property rights throughout Mexico, the disastrous consequences of that law inspired innovative efforts to reconstitute communal property. Discontent with the usurpation of village land led to the invention of a new type of communal property in the form of *ejidos* during the Mexican Revolution (Baitenmann, 2011). In a recent transnational history, Olsson (2017) documents how such ideas filtered northward from Mexico to the United States, where dispossession and agrarian discontent were receiving increasing political attention by the 1930s. Commissioner of Indian Affairs John Collier specifically cited *ejidos* as an example of a workable alternative to private property in arguing for the repeal of the Dawes Act (Taylor, 1980, p. 24). While the Dawes Act was ultimately repealed in 1934, its effects are still felt today (Ruppel, 2008), and the United States never had an equivalent to Mexico's large-scale rollback of private property institutions.

The results of the 1856 Lerdo Law in Mexico and the 1887 Dawes Act in the United States show that the privatization of communal land produced adverse consequences for the intended beneficiaries of those projects. In both cases, a large percentage of the privatized land was either sold or otherwise alienated from its original owners (Akee, 2020; Herrera, 2012;

Assies, 2008; Banner, 2005; Purnell, 1999; McDonnell, 1991; Carlson, 1981). Mexico's answer to the problem of dispossession, in the form of *ejidos*, has been criticized by academics for providing imperfect property rights (Albertus et al., 2016). Similar arguments have been made regarding U.S. Indian land that remains communal property (Anderson and Lueck, 1992). The notion that communal property rights with restrictions on alienation are somehow defective is still deeply embedded in academic discourse, despite the counterpoints raised by Ostrom (1990). However, there is little real evidence of a "tragedy of the commons" on Indian reservations (Bobroff, 2001; Carlson, 1981, pp. 115-132) or in *ejidos* (Boyer, 2015, pp. 246-247). Rather the subsequent chapters document that it was the *privatization* of the commons that often had tragic consequences. The institutions of communal property developed to address that tragedy, however "imperfect" in the view of critics, have been effective in impeding further alienation and guaranteeing access to land for many Indigenous groups.

If the privatization of communal property under the Lerdo Law and the Dawes Act opened the door to dispossession and made land rights *less* secure, those laws clearly did not achieve their stated goals. What purpose, then, did such legislation serve? Marx argued that such policies add to the ranks of the industrial reserve army. However, the dispossession of Indigenous peoples in the United States and some other places settled by British colonists was unlike standard primitive accumulation in that it was primarily geared towards acquiring land, rather than generating a supply of labor for industry (Nichols, 2020, pp. 28, 87).

Nor was the privatization of communal property in the aftermath of Mexico's 1856 Lerdo Law associated with immediate rapid industrialization (Bartra, 1993, pp. 32, 85). That is interesting in light of Matsuyama's (1992) model demonstrating that the effect of agricultural productivity enhancements on industrial growth may depend on whether the economy is open or

closed to trade. In a closed economy, greater agricultural productivity can potentially free up an abundant supply of cheap labor that subsequently facilitates industrial growth. In an open economy, in contrast, higher agricultural productivity could actually deter industrialization. Given that the Mexican economy was export-oriented in the late nineteenth century (Cortés Conde, 1992), Matsuyama's open-economy model may be applicable. However, even though the privatization of communal property did not contribute to industrialization at that time, it still had important ramifications by undermining or ruining the livelihoods of independent producers and thereby increasing dependence on wage work.

In contrast to the Lerdo Law, Mexico's 1992 constitutional amendments allowing the privatization of communal property did coincide with a boom in export-oriented manufacturing in the 1990s. Factors contributing to that boom include the liberalization of investment and trade, which facilitated greater cross-border production sharing and offshoring. Changes in laws governing property rights, trade, and investment were part of a broader package of neoliberal reforms that Mexico implemented in the 1980s and 1990s (Arroyo, 2019). David Harvey links the post-1992 privatization of Mexican communal property with the global rise of neoliberal policies which are, in turn, linked to the global growth of export processing zones and foreign investment (Harvey, 2003, pp. 154, 160). He considers Mexico's neoliberal reforms as part of a larger process of accumulation by dispossession that, among other things, releases assets previously tied up by non-capitalist governance structures, promotes the substitution of peasant agriculture with agribusiness, and increases dependence on wage labor (ibid., pp. 145-146).

Mexico's 1992 constitutional reforms may also be associated with the manufacturing boom in a more direct way, via the linkage between rural outmigration and industrial labor supply. It has already been noted that the 1992 reforms generated outmigration from *ejidos*

(Valsecchi, 2014; de Janvry et al., 2015). That is consistent with Marx's predictions about the role of capitalist property institutions in purging peasant proprietors from the countryside. Furthermore, Sanderson (1984, pp. 141-147) argues that landless peasants are more likely than *ejido* members to migrate away from rural areas. Thus, the 1992 constitutional reforms, which were designed to curb the creation of new *ejidos*, may have increased outmigration from rural areas. Trade liberalization and cutbacks in government farm support also contributed to a loss of agricultural employment (Cypher and Delgado Wise, 2010, p. 142). If neoliberal reforms freed up an abundant supply of workers for labor-intensive manufacturing industries in Mexico, then they are perhaps close to the classical case of primitive accumulation described by Marx, in which agrarian institutional change augments the supply of industrial wage labor.

There are also reasons to suspect that structural reforms in agriculture, and the resulting out-migration from rural areas, may be connected specifically to the growth of Mexico's offshoring sector. Migration from rural areas of Mexico to the northern border cities was motivated in large part by jobs in export-processing plants called *maquiladoras*, which are deeply integrated into cross-border supply chains (Enríquez, 2009; Williams and Homedes, 2001). *Maquiladora* managers in the northern border cities frequently complained of chronic labor shortages in the 1980s and early 1990s and depended on an influx of workers from the interior of Mexico (Kopinak, 1996, pp. 49-88). Furthermore, the *maquiladora* program was established in 1965 partly as a means of providing jobs to former migrant farmworkers who were left unemployed by the discontinuation of the *bracero* guest worker program in the United States (Sklair, 1993, pp. 27-28). Thus, *maquiladoras* have been linked with migration from the beginning. It seems likely that some portion of the migration generated by structural reforms in the *ejido* sector was destined for northern Mexico's centers of *maquiladora* production. The

influx of workers from the countryside may have helped restrain *maquiladora* wage growth, promoting Mexico's competitiveness as a destination for foreign direct investment.

Because the linkage between individual titling of communal property and outmigration from rural areas has already been well established by previous research, the focus of Chapter 4 is on the nature of work in offshoring-intensive manufacturing plants of the *maquiladora* type. The main question concerns the extent to which Mexico's offshoring sector is especially prone to large fluctuations in employment (Bergin, Feenstra, and Hanson, 2009). Higher employment volatility in the offshoring sector would suggest that the type of industrial work available to rural migrants is not very stable or dependable. This relates to a point made by Bhaduri (2015; 2018) that the destruction of livelihoods in subsistence agriculture is not met with a corresponding increase in formal-sector jobs in the case of India. Many of those who migrate out of rural areas do not find reliable formal-sector employment. This insight is relevant to Mexico, where the alternative to manufacturing employment during cyclical downturns is often informal sector work (Fernández and Meza, 2015). Thus, greater employment volatility in Mexico's offshoring sector would have implications for both unemployment and precarious informal-sector employment. It would also have implications for the broader neoliberal strategy of privatization and liberalization that Mexico embarked upon in the 1980s.

Contrary to the goals of the neoliberal reforms, it appears that Mexico has become locked into the lower echelons of the global value chain. The *maquiladora* offshoring sector has generated few backward linkages with the rest of the national economy (Ruiz Nápoles, 2004), and economic growth under the neoliberal model of development has fallen short of expectations (Cárdenas, 2010). Although many people abandoned the countryside in recent decades, they did not necessarily find steady, reliable work in cities. A similar case can be made regarding the

types of jobs available to American Indians who migrated to cities in the wake of dispossession between 1887 and 1930. The paradox of urbanization and industrialization without major improvements in standards of living suggests that the "structural transformations" alluded to in the title of this dissertation do not necessarily represent advances. Rather, they may be welfare-reducing for many individuals. That is an unpleasant legacy of the privatization of communal property and other institutional changes that underpinned those structural transformations.

The results documented in this dissertation may also have relevance for other developing countries where simultaneous neoliberal reforms in industry and agriculture undermine peasant economies and thereby generate a supply of low-wage workers for labor-intensive industry and capitalist agriculture. Although it is often said that workers in developing countries take low-wage jobs because those jobs are better than the alternative (e.g., farming), institutional reform, such as the privatization of communal land, may be what makes the alternative less appealing (and that may be precisely the point of such reforms).

Chapter 2: The Loss of Communal Land and American Indian Migration

Introduction

Historically, most Indigenous land in the United States was communally held. The Dawes General Allotment Act of 1887 was presented as a way to make Indians into successful farmers by giving them private property rights over reservation land. Contrary to that goal, however, the ultimate effect of allotment was a mass transfer of land to Whites and a *decline* of Indian farming (Carlson, 1981). An influential report suggested that one reason allotment failed was unrealistic assumptions: "It almost seems as if the government assumed that some magic in individual ownership of property would in itself prove an educational civilizing factor" (Meriam, 1928, p. 7). Although, as that quote implies, White advocates of allotment often framed their arguments in mystical and racist terms, their main economic concern was that communal property rights on reservations would remove the incentive to work hard and improve the land (Bobroff, 2001, p. 1566). The view that complete individual property rights are a precondition for investment and long-run growth is certainly not foreign to economists. One U.S. economic historian summarizes the prevailing conventional wisdom is these terms: "It is an article of faith among both economic historians and business tycoons that secure property rights are critical for economic development" (Lamoreaux, 2011, p. 275).

The privatization of Indigenous communal resources has been a recurring theme in U.S. history. Bauer (2021) links the Dawes Act to the 1953 "Indian Freedom Act," that sought to terminate the federal government's trust relationships with tribal governments, and to a 2016 proposal to privatize reservation lands in order to facilitate natural resource extraction. In all three cases, the privatization of tribes' communal land was framed as an act of individual

liberation. Supporters of the Dawes Act even called it the "Indian Emancipation Act," despite the fact that it undercut tribal self-determination. Some economists continue to argue that property institutions contribute to poverty on Indian reservations (e.g., Anderson and Lueck, 1992; Leonard, Parker, and Anderson, 2020), while others find no evidence of this (Akee, 2009; Akee and Jorgensen, 2014). The results of the Dawes Act suggest that it was not communal property which impoverished reservations, but rather the policy of privatizing that property and forcing it into markets where it was bought up by Whites. Ultimately, the Dawes Act resulted in the creation of a checkerboard pattern of mixed tribal and private landownership on many reservations which continues to complicate economic development projects by preventing land consolidation (Greenwald, 2002, p. 88; Banner, 2005, p. 285).

Previous research has shown that the Dawes Act failed to achieve its goal of assimilating Indians by making them self-supporting farmers (Carlson, 1981; McDonnell, 1991). However, relatively little is known about where the ex-allottees went after losing their land. It seems likely that some went to live with relatives or rented homes and worked for wages on, or near, their reservations (Akee, 2020, p. 129; Carlson, 1981, pp. 155-157). However, there is also scattered anecdotal evidence that allotment may have contributed to the initial phases of Indian urban migration (O'Brien, 2021, p. 42; Gray, 2021, pp. 124-125; Shoemaker, 1988, p. 437). While subsequent assimilationist policies clearly generated much larger reservation-to-city migrations starting in the 1950s (Eschbach, 2004), census records indicate modest increases in urbanization during the Dawes Era (Howard and Lobo, 2013; Carlson, 1981, p. 155). This chapter will examine the hypothesis that allotment of reservation land increased migration, both to other states and to cities. While it is clear that many people who lost their allotments did not move far away, it is possible that others did migrate long distances in the wake of dispossession.

Unlike the United States, there is substantial research on communal property institutions and migration in Mexico. Valsecchi (2014) and de Janvry et al. (2015) find evidence that a land titling program in Mexico increased out-migration from rural communities. The latter study argues that property titling increased welfare by freeing households to allocate land and labor more efficiently. It is not clear that this is normally the case, however. While Indigenous migration to urban areas in the United States sometimes increased money income, it has also been associated with unemployment, inadequate housing, increased stress, and isolation from tribal support systems (Snipp, 2004). Fixico (2000, p. 3) argues that migration to cities spawned "a sociocultural transition from communalism to a foreign individualism." Furthermore, in the Dawes Era, many individuals who migrated might have preferred to stay on reservations had allotment never occurred. In other words, migration may have been a side effect of land loss, rather than a desired goal. In this view, the privatization of reservations under the Dawes Act altered rural life so radically that previously unthinkable moves became necessary for survival. The next three sections review the relevant historical literature and subsequent sections examine the effects of Dawes Era land loss on migration patterns revealed in the 1930 Census.

American Indian Property Rights

Prior to European contact, North American Indians exercised property rights over the use of land, but the sale of land was not generally practiced (Banner, 2005, p. 57). Greer (2018, p. 253) states that "North America on the eve of colonization was a quilt of common properties, each governed by the land use rules of a specific human society." As English colonists began arriving in the seventeenth century, they brought with them a system for trading land ownership rights that was foreign to the native landowners. White settlers were often keen to purchase land

and Indians had limited power to reject their offers, despite that fact that they were recognized in English law as the rightful owners of the land. The settlers' efforts to acquire large tracts of land at low prices were frequently aided by environmental transformations that made Indigenous lifeways untenable, combined with blatant fraud and a latent threat of violent expropriation (Banner, 2005, pp. 49-84). Often the settlers bought land from members of a tribe who were not authorized by the tribe to sell it. In some cases, White merchants induced Indians to take out mortgages with the intention of later foreclosing and acquiring their property (Park, 2016).

Dubious land transactions by British colonists may have contributed to the Indians' decision to form an alliance with France in the Seven Years' War of 1756 to 1763 (Banner, 2005, pp. 86-87). To reduce the risk of future conflagrations, after 1763 only colonial governments, and not individual settlers, were authorized to purchase land from Indian tribes. This principle, i.e., that land purchases were confirmed by "treaties" rather than individual "contracts," was adopted by the United States after independence (ibid., pp. 93, 105). In the Revolutionary War, most tribes sided with Britain against the White settlers, which subsequently provided an excuse to confine those tribes to a fraction of their former territory and confiscate the rest (ibid., pp. 121-122, 127). Because Indians could not vote, representative governments generally placed a low priority on protecting tribal property against White trespassers and states began granting "preemption rights" to Whites for unceded tribal land (ibid., pp. 144, 160-164; Nichols, 2020, pp. 39-40). That stance was legitimated by a new legal precedent, established in *Johnson v. M'Intosh* (1823), that Indians did not own their land, but merely possessed a "right of occupancy," which could be unilaterally extinguished by the United States government (Robertson, 2005, pp. 95-116).

In 1796, one U.S. representative called the idea that the state could unilaterally declare itself the owner of Indian land with the right to evict its legitimate occupants "hostile to, and destructive of, all security in property" (quoted in Banner, 2005, p. 167). Indeed, the *Johnson* decision provided the state of Georgia with legal ammunition in its successful effort to evict the Cherokees from their homeland (Robertson, 2005, pp. 117-142). In 1831, the Supreme Court further weakened the legal status of Indian tribes by declaring them "domestic dependent nations," rather than sovereign nations. Other factors that contributed to tribes' declining bargaining power in the nineteenth century included the influx of White settlers into the western United States facilitated by the construction of transcontinental railroads and the increasing political clout of squatters, which culminated in the Homestead Act of 1862. As the frontier moved westward, the United States government increasingly abrogated or ignored the treaties it had previously signed with tribes. In practice, all of this meant that tribes' property rights over their land were subject to arbitrary revocation in order to provide secure property rights to White homesteaders (Carlos, Feir, and Redish, 2022).

Throughout the nineteenth century, U.S. policy toward American Indians responded to the interests of both western opportunists and eastern philanthropists (Banner, 2005, pp. 5). The creation of Indian reservations in the mid-nineteenth century represented a compromise between those groups, whereby Indians would be secluded and protected from White society, and White settlers would get most of their land (ibid., pp. 230-233). However, as westward expansion continued unabated and public land available for settlement became increasingly scarce, pressure mounted to open up reservation land. Land hunger reached such extremes that settlers became "impatient of the possession of any land by the Indian," according to Merrill Gates of the Board of Indian Commissioners (quoted in Bauer, 2021, p. 205). Many Whites felt that, because

reservations typically lacked intensive, market-oriented agriculture, they represented barriers to economic progress (Greenwald, 2002, pp. 22-23). White settlers could invoke a well-established intellectual tradition that viewed unproductive use of land as a justification for expropriation (Wood, 2003, pp. 73-101). One proposed solution, which gradually gained favor among both western land-seekers and eastern philanthropists, would be to allot reservation land to each Indian household and then sell whatever land was left over to Whites (Otis, 1973, pp. 8-32). That idea became federal policy with the passage of the Dawes Act in 1887, named after Massachusetts Senator Henry Dawes (Greenwald, 2002, p. 29).

Advocates of western interests often framed allotment as a solution to the "Indian problem" (Black, 2015, pp. 90, 93, 94, 107). According to Secretary of the Interior Carl Schurz, allotment would solve the "Indian problem… in such a manner that they no longer stand in the way of the development of the country as an obstacle" (quoted in Black, 2015, p. 88). Toward this end, advocates of allotment pursued the "blotting out of the reservations as fast as it can be safely done," as one proposal put it (ibid., p. 90). Eastern reformers who supported allotment, for their part, argued that it would benefit Indians as much as Whites by preparing them for citizenship and for the rigors of a market economy (Bauer, 2021, pp. 203-204). The immediate goal of the Dawes Act was to convert Indians into self-sufficient farmers (McDonnell, 1991, p. 10; Greenwald, 2002, pp. 15, 25; Akee, 2020, p. 133). The long-term goals, according to Carlson (1981, p. 79), were to "break up the tribe as a social unit, encourage individual initiative, further the progress of Indian farmers, reduce the cost of Indian administration, secure at least part of the reservation as Indian land, and open unused lands to white settlers." The overarching long-term goal was to assimilate Indians into White society (ibid., p. 18).

Underlying the arguments in favor of allotment was a deep-seated belief that many of the problems facing Indian reservations were the result of existing land tenure systems and that the privatization of communal land would solve those problems. Senator Dawes himself contended that Indians had "got as far as they can go, because they own their land in common. It is Henry George's system, and under that there is no enterprise to make your home any better than that of your neighbors. There is no selfishness, which is at the bottom of civilization. Till this people will consent to give up their lands, and divide them among their citizens so that each can own the land he cultivates, they will not make much more progress" (quoted in Otis, 1973, pp. 10-11). For advocates of the Dawes Act, private property cultivated the greed and competitiveness that a capitalist economy required. Indian agents called communal ownership "communistic" and claimed that it stifled individual enterprise on reservations (ibid., pp. 9, 136). Discussing the implementation of the Dawes Act, Indian Commissioner Thomas Morgan stated in 1889 that "tribal relations should be broken up and socialism destroyed" (quoted in Black, 2015, p. 96).

Despite the bombastic rhetoric of the proponents of allotment, land tenure systems among Indigenous agriculturalists were not radically different from the communal property rights systems of medieval England and colonial New England (Banner, 2005, p. 258; Greer, 2018, p. 259). Prior to allotment, tribes had diverse systems in place for assigning rights to use land and other resources, although one common denominator is that land transfers to people outside the tribe were usually restricted. Most agricultural tribes allocated individual or familial rights to use (but not sell) farmland. Non-agricultural tribes also had concepts of property, although territory typically belonged to tribal groups rather than nuclear families or individuals (Bobroff, 2001, pp. 1570-1599). In 1835, the Supreme Court stated that Indians occupied the government-owned land allocated to them "as their common property" (quoted in Banner, 2005, p. 236). For

the most part, the U.S. government had only prescribed the outer boundaries of reservations. The allocation of rights to use land within reservations had usually been left to the tribes before the Dawes Act (ibid., p.254).

Most tribes felt that privatizing reservations would be a mistake. In 1878, Cherokee chief Dennis Bushyhead stated that "our people have been taught from remote ages to believe that the surface of the earth, apart from its use, is not a chattel" (quoted in Banner, 2005, pp. 264-265). In 1882, the Seneca Nation of New York argued that it had achieved prosperity precisely because the tribe's land was inalienable and owned in common (Greenwald, 2002, p. 28). The Creek Nation conducted a study of the effects of early experiments with allotment, which it sent to Congress in 1883. The study's main conclusions were that allotment had impoverished many Indians and had actually caused the death rate to increase, a trend that was only reversed after the tribes returned to tenancy in common (Banner, 2005, p. 273). In 1894, a Choctaw memorial to Congress stated that "whenever you touch our 'land in common' we will meet you with all the opposition in [our] power" (quoted in Black, 2015, p. 112). Albert Yava (Hopi) stated that "none of us [want] that our lands should be measured into separate lots, and given to individuals" (ibid., p. 129). Dewitt Clinton Duncan (Cherokee) criticized the arrogance of the US government in arbitrarily redefining property rights on Indians lands through allotment, which necessarily entailed the annulment of pre-existing land rights (ibid., p. 134).

In response to such strident opposition to allotment, a few of the more vocal tribes were exempted from the Dawes Act. Most of those tribes were located in Indian Territory, now part of Oklahoma (Otis, 1973, p. 183). However, the latter group of tribes would be subjected to allotment by the Curtis Act in 1898 (Greenwald, 2002, p. 29). In the end, pressure from White interest groups won out over Indian opposition and allotment became official government policy.

One of very few legislators opposed to allotment, Colorado Senator Henry Teller, said "I want to put on record my prophecy in this matter, that when thirty or forty years have passed and these Indians shall have parted with their title, they will curse the hand that was raised professedly in their defense to secure this kind of legislation" (quoted in Banner, 2005, p. 271). Unfortunately, Senator Teller's "prophecy" would prove quite prescient.

The Dawes Act and Land Loss

The Dawes Act of 1887 authorized the allotment of 160 acres of reservation land to each Indian head of household. Indians ostensibly had the right to select their own allotments. However, if they did not make a selection within four years, a parcel would be chosen for them. Allotments were to be held in trust by the government for a period of 25 years, during which time they could not be sold. At the end of the trust period, sales restrictions would be lifted, and the owner would be issued a patent in fee. Any reservation land left over after the allotment would be declared surplus and opened up to White settlement (Otis, 1973, pp. 177-184). Although the Dawes Act required tribal consent to distribute surplus lands to White settlers, a court ruling in 1903 eliminated that requirement. Furthermore, tribes could not choose to remain unallotted and individuals could not refuse to accept allotments (Carlson, 1981, p. 10). In a few cases, force was used to coerce tribes into accepting allotment, although acquiescence was usually secured without violence (ibid., p. 41; McDonnell, 1991, pp. 22-25).

Given that the purpose of the Dawes Act was to provide full property rights to each Indian, it may seem odd that property sales were forbidden for 25 years. The 25-year trust period was originally established to prevent a repetition of previous experiments with allotment that had ended with Indians losing their land (Otis, 1973, pp. 50-51). Senator Dawes himself

said, in 1890, “the white has never been known to take his foot off from an Indian’s land, when he once got it on” (quoted in Otis, 1973, p. 109). Although the fear of land loss was justified, the trust period created problems, which were dramatically amplified in cases where an allottee died. That is because the law did not allow the allottee to name an heir, but rather made inheritance dependent on the laws of the surrounding state, which typically meant that all descendants would claim small ownership shares of the property. Since “surplus” land was sold to Whites, it was no longer available as a reserve to accommodate Indian population growth (Shoemaker, 2003). Over time, this would contribute to the problem of ownership fractionation, as a large number of descendants claimed small shares of allotted trust land, complicating decision making and the productive use of the land (Leonard, Parker, and Anderson, 2020).

Not all reservations were allotted at the same time, partly because the administrative costs of surveying the land and assigning property rights could be quite substantial (Carlson, 1981, p. 41). Some reservations were allotted before the Dawes Act passed, while others were allotted at various points between 1887 and 1934, and still others were never allotted (ibid., p. 12). Leonard, Parker, and Anderson (2020) show that reservations that were allotted earlier tended to have a higher percentage of prime farmland, as measured primarily by soil quality and rainfall. Most of the reservations in the Great Plains region were eventually allotted, whereas many of the reservations that were never allotted are concentrated in the desert Southwest. Thus, Indian land with a high economic value ran the highest risk of being allotted. This fits with the argument of Carlson (1981, pp. 35-42) that the Office of Indian Affairs succumbed to lobbying pressure by White farmers and merchants who stood to benefit from allotment by acquiring prime farmland from Indians. If the agency had instead prioritized guarding Indian property, the order in which reservations were allotted might have been determined by their degree of preparedness for

participation in a market economy, rather than simply by the quality of their farmland. It has also been noted that Indian agents were under intense pressure from neighboring communities to reserve the best "surplus" land for Whites (ibid., p. 43).

A number of changes were implemented over the two decades following 1887, which modified the way in which allotment was actually carried out. The Dawes Act was amended in 1891 to provide 80 acres to each adult, instead of 160 acres to the head of household, which was supposed to protect women divorced by their husbands. The act of 1891 also permitted the leasing of allotments for the first time. In 1902, another act of Congress allowed the sale of allotments before the end of the 25-year trust period in the event that the original owner died (Greenwald, 2002, pp. 31-32). The Burke Act of 1906 provided that allottees could be declared "competent" to handle their own affairs prior to the end of the trust period, in which case they would receive a fee-simple patent to their property giving them unrestricted private property rights. Most allottees who were declared competent immediately sold their land. Shortly after passing the Burke Act, Congress authorized the Commissioner of Indian Affairs to sell allotments held in trust (Carlson, 1981, p. 13).

By allowing the issue of fee patents prior to the end of the 25-year trust period to those judged to be "competent," the Burke Act opened the door to widespread land sales and land fraud. There were cases in which non-Indians convinced allottees to apply for "competency" declarations and proceeded to swindle them out of their land (McDonnell, 1991, p. 89). Indians who were declared "competent" were often targeted by "land sharks" seeking bargains and automobile dealers who used high-pressure sales tactics to acquire Indian land. Local merchants would sometimes extend credit to Indians until they became so indebted that they would have to sell their allotments to pay off their debts (ibid., p. 101). In some cases, Indians used their land

as loan collateral and then lost it after defaulting on their debt (ibid., p. 106). Land loss was sometimes the result of intentional efforts by White lenders to extend loans to Indians immediately prior to allotment, even though (or especially because) it was known they would not be able to pay them back (ibid., p. 92).

O'Brien (2021, pp. 41-42) discusses how, in 1905 and 1906, "land sharks" set up offices near the White Earth reservation (Minnesota) with the intention of acquiring Indian allotments at low prices. By 1933, 94% of the allotments on that reservation had passed out of Indian ownership, often through various types of fraud (ibid., p. 37). Similar stories unfolded on other reservations. By 1914, 75% of Indians who received fee patents for allotments on the Yankton reservation (South Dakota) had sold their land and, on the Winnebago reservation (Nebraska), 93% had lost their land (McDonnell, 1991, p. 93). By 1916, 70% of the fee patent land on the Fort Peck reservation and 90% of that on the Crow reservation (both in Montana) had been sold. About 75% of the patentees on the Umatilla reservation (Oregon) had sold their land, with some becoming destitute as a result (ibid., p. 100). On the Coeur d'Alene reservation (Idaho), most allotments were either sold to Whites or mortgaged and subsequently seized for failure to repay debt. Through a combination of sales, seizures, and allocation of "surplus" land to Whites, the tribe lost control of about 84% of its land (Cotroneo and Dozier, 1974). Tellingly, the namesake of the Burke Act, Charles Burke, who later became the Commissioner of Indian Affairs, stated: "The best evidence that an Indian is not competent is for him to ask for a fee patent, because he is better off without it if he intends to keep his land" (quoted in McDonnell, 1991, p. 114). Thus, Indian Office leadership was well aware that, in places where reservation land was coveted by White settlers, "competency" declarations often led directly to land loss.

Despite the miserable record of the Burke Act up to 1916, Indian Commissioner Cato Sells oversaw a massive increase in the number of competency declarations from 1917 to 1920. To facilitate the process, his office established "competency commissions" to process large numbers of cases (Carlson, 1981, p. 16). This policy was largely a response to intense pressure from western legislators (McDonnell, 1991, p. 103). That political pressure, in turn, was likely motivated by high agricultural prices during World War I, which increased lobbying to open up reservations to White settlement (Carlson, 1983). Perhaps the most disturbing aspect of the Burke Act's implementation under Commissioner Sells was that fee patents were often issued to Indians who did not want them and had not applied for them (McDonnell, 1991, p. 98). Because fee patents subjected allotments to property taxation, Indians who were declared "competent" without their consent or knowledge were at risk of losing their property if they did not pay taxes (ibid., p. 116). Although this practice was ultimately abandoned, and the subsequent commissioner made and effort to return such allotments to trust status, less than 5% of the approximately 10,000 forced fee patents were cancelled (ibid., p. 118).

Concerted efforts to shorten the trust period to less than 25 years in order to speed up the sale of Indian land to Whites were abandoned at a time when increasing numbers of allotments could be sold or otherwise alienated due simply to the expiration of the trust period, even without "competency" declarations. In Oklahoma, White trespassers on Indian land sometimes acquired ownership of allotments using the state's adverse possession law, which gave substantial rights to squatters (Baker, 2021, pp. 290-291). Other White settlers took advantage of some Indians' limited English proficiency to deceitfully acquire signatures granting them power of attorney and thus allowing them to sell or transfer allotments to different owners (ibid., p. 293). In addition to

outright land fraud, the taxation and seizure of unrestricted allotments continued to be another major source of land loss (Justice, 2021, p. 17).

Reservation land with valuable timber resources or mineral deposits was particularly coveted by commercial interests. Much of that land was eventually opened up to allotment, even if it had no agricultural value. This practice was clearly at odds with the goal of transforming Indians into self-sustaining farmers and it also ran counter to the Dawes Act's stipulation that allotments should contain land adequate for farming or grazing. Such practices were primarily aimed at giving Whites access to valuable resources that had once belonged to tribes (McDonnell, 1991, p. 10). Furthermore, land that was alienated as "surplus" often held significant cultural value because of its role in traditional activities unrelated to farming. For example, due to the sale of allotments and the distribution of surplus land, members of the Nez Perce tribe lost control of the large majority of their reservation (in Idaho), barring access to traditional hunting and fishing sites (Greenwald, 2002, pp.86-88).

One of the very few exceptions where allotment did *not* lead to dispossession was the Jicarilla Apache reservation (New Mexico), originally allotted in the 1890s. In 1906, the Commissioner of Indian Affairs called this a case of "premature allotment" because "the allotment was not induced by pressure from white land seekers, but by the urgency of the Indians themselves" who thought "that the formal allotment of their lands would settle any question as to their right to the reservation" (Department of the Interior, multiple years). Given that the Dawes Act was designed to eliminate reservations and tribal governments, the idea of Indians using it to protect their tribal land was a matter of grave concern to the commissioner. His suspicions were confirmed when, after the federal allotment policy ended, members of the tribe opted to transfer their individual allotments back to tribal control in 1943 (Greenwald, 2002, p. 137). The Jicarilla

Apache Nation's experience was anomalous because the reservation did not attract large numbers of White settlers, but the commissioner's analysis clearly lays out the normally unspoken logic of the Dawes Act as a mechanism for allocating Indian land to Whites.

Antonio Luhan (Taos Pueblo) succinctly summarized the process of dispossession that resulted from allotment: "our white neighbors are all around the edge of us, they always *look*…. And, maybe they see gold. They might see coal…. They might begin to loan money… or buy acres… And [Indians] will lose their land in a few years because they have borrowed on it. That is enough to finish the Indians" (quoted in Black, 2015, p. 141). Allotment was indeed ruinous. Indian reservations shrank from about 136 million acres in 1887 to 34 million acres in 1934, although multiple factors contributed to the decline (Carlson, 1983, p. 39). While it is not clear how much of the privatized land ultimately ended up in non-Indian hands, estimates by federal agents suggest that the share of Indians who received patents-in-fee and subsequently lost their land may have been in the range of 75% to over 90% (ibid.; McDonnell, 1991, p. 113). An estimated 100,000 Indians lost their land after receiving fee patents (ibid., p. 121; Black, 2015, p. 142). As a consequence of land loss, 49% of Indians on allotted reservations were estimated to be landless by 1933 (Taylor, 1980, p. 7).

Why did so many allottees lose their land? As already mentioned, mortgage foreclosures and tax sales played a role. Also, in some cases, sales were motivated by the need for cash to meet urgent expenses (Baker, 2021, p. 290). More fundamental factors that contributed to land sales included limited access to credit, capital, and technical assistance, the low quality of farmland on some reservations, remoteness from markets, and a cultural aversion to farming among some tribes (McDonnell, 1991, pp. 123-124; Taylor, 1980, p. 7). In addition, state and local governments often failed to provide Indians with basic services, such as road maintenance,

because they did not pay property taxes during the 25-year trust period (Otis, 1973, pp. 105-106). Finally, allotees could not count on much help, or even sympathy, from the Office of Indian Affairs. In 1901, Indian Commissioner William A. Jones was sanguine about the disastrous consequences of allotment: "… that there will be many failures and much suffering is inevitable in the very nature of things, for it is only by sacrifice and suffering that the heights of civilization are reached" (quoted in Carlson, 1981, p. 14).

Given that the Dawes Act resulted in large-scale land loss, it is perhaps not surprising that it also failed to achieve its goal of making most Indians into successful independent farmers (Carlson, 1981, pp. 146-155). This conclusion is interesting, however, in light of substantial evidence that Indian farming had actually been progressing steadily prior to allotment (ibid., pp. 126-130). How is it possible that issuing individual property titles could have resulted in the decision of so many farmers to reverse course and sell their land? The environmental and technological obstacles that Indian farmers faced would not have been affected much by the Dawes Act. However, compared to a system of land use rights on a closed reservation, allotment likely prevented the exploitation of economies of scale in livestock grazing, decreased the availability of tribal services, and increased Indians' reliance on White-dominated institutions where discrimination against Indians was widespread (Carlson, 1981, pp. 89-92). Allotment also meant that Indian farmers had to pay property taxes, once they had fee-simple title, and lost access to tribal surplus lands (ibid., p. 109). All of these factors may have contributed to the decline of farming on allotted reservations, as compared to closed reservations.

Akee (2020) examines the effects of allotment on the White Earth reservation, where 80% of the land had been privatized by 1909, by comparing it with the Red Lake reservation, which was not allotted and remained communal property. Because the reservations are located

only 80 miles apart from each other in Minnesota and were both populated by Anishinaabe people, the allotment of only one of the two reservations could be construed as a sort of natural experiment. Using a difference-in-differences approach with census data from 1900 and 1910, Akee finds that allotment significantly decreased homeownership rates on the White Earth reservation. It also increased the average number of adults per household, possibly as a result of individuals losing their land and moving in with members of their extended families. There was also a decline in farming on the White Earth reservation and an increase in timber industry employment, which is consistent with Carlson's argument that allotment undermined Indian farming. The decline in homeownership was most dramatic for households engaged in hunting and gathering. If hunting occupations proxy for non-wage employment, those results would suggest that the poorest were most likely to lose their homes (and presumably their land too).

Similar to the enclosure of communal property in early modern England, the privatization of reservation land led to dispossession. Allotment was also an attack on tribal sovereignty, and its effects were therefore political as well as economic (Chang, 2011). However, dispossession-by-allotment was an almost invisible process because it occurred mainly through normal market transactions based on contracts. As Megan Baker points out: "Once allotment was finalized and everyone on the Dawes Rolls had been allocated their parcels, Choctaw land loss gradually became understood as a consequence of individual decisions rather than the effect of a policy that created the conditions that induced people to make difficult decisions regarding their allotments and contributed to a collective loss of land" (Baker, 2021, p. 289). Throughout American history, the sale of Indian land to Whites has often involved an element of compulsion, even when the formal legal transactions are ostensibly free of coercion (Banner, 2005, p. 4).

That was partly because Whites had disproportionate power to influence the judicial and political context in which contracts were enforced.

The Dawes Act was not the first effort to implement allotment. Earlier allotments in the United States had yielded similarly dire consequences, though on a smaller scale (Greenwald, 2002, pp. 16-18). Native dispossession had also occurred by other means, such as warfare, but allotment is distinguished by a reliance on market mechanisms and economic rationalizations. Starting in the seventeenth century, English advocates of colonization had advanced the premise that it was legitimate for settlers to appropriate Indigenous landholdings that were not being used profitably if doing so would increase the value of agricultural production (Wood, 2003, pp. 78-101). Similarly, after 1887, dispossession was once again justified as a means of reallocating land to its highest-value use. For example, Secretary of the Interior Franklin Lane stated during a 1919 congressional hearing, that he agreed to lease partially cultivated land on the Crow reservation, displacing Indian farmers and violating his own department's regulations, because "it was a perfect crime to have that land lying out there unused" (quoted in McDonnell, 1991, p. 65). Any benefits allotment may have conferred on White settlers, or the American economy generally, came at a substantial cost to American Indians.

By the 1920s, White public sentiment had begun to turn against allotment, and assimilationist Indian policy in general, as its disastrous consequences became increasingly obvious. Numerous failures of federal Indian policy were documented in a study known as the Meriam Report that was published in 1928 by an organization that would later become the Brookings Institution. Some modest reforms were undertaken, but it was not until the election of Franklin Roosevelt as president, in 1932, that the Office of Indian Affairs radically reversed course on allotment. The new Commissioner of Indian Affairs, John Collier, had been an

outspoken critic of the agency and an advocate for Indian self-determination. New allotments were suspended in early 1933 and the Dawes Act was repealed as part of the 1934 Wheeler-Howard Act, also known as the Indian Reorganization Act (IRA). The IRA was the centerpiece of the Indian New Deal, and it provided a framework for the revitalization of tribal governments and the partial recuperation of their land base (Taylor, 1980, pp. 9-29).

Allotment and American Indian Migration

The largest wave of Indian migration to the cities began after 1940, facilitated by industrial job opportunities and military service during World War II. Between 1952 and 1972 the Bureau of Indian Affairs subsidized the relocation of more than 100,000 people from reservations to urban areas. That program was initially launched as part of a broader federal government project to assimilate Native Americans and terminate federal recognition of tribal governments (Eschbach, 2004, pp. 77-79). However, smaller waves of urban migration had already occurred earlier in the twentieth century. According to census records, the percentage of Indigenous people living in urban areas rose from near 0.0% in 1890 to 4.5% in 1910 to 9.9% by 1930 (Howard and Lobo, 2013; Carlson, 1981, p. 155). The 1928 Meriam Report contains an entire chapter on the migration of Indians from reservations to "industrial communities," based on 821 interviews with urban Indians from 45 tribes (Meriam, 1928, p. 677). The time and expense dedicated to those interviews suggests that migration was perceived as an important issue at the time. Nonetheless, recent academic research on Indian migration before World War II is relatively scarce (LaPier and Beck, 2014).

Shoemaker (1988) documents how several American Indian social and political organizations sprang up in Minneapolis in the 1920s during an initial wave of urban migration,

which may have facilitated subsequent waves of migration by establishing support networks in the city. Many of the initial leaders of those organizations had sold their reservation allotments prior to moving to the Twin Cities. That was not a coincidence according to O'Brien (2021, p. 42), who argues that the privatization of tribal land and ensuing cases of land loss spurred migration from the White Earth reservation to Minneapolis beginning in the 1910s. Estes (2021, p. 53) refers to a 1963 study of the Lower Brule Sioux Tribe which suggested that allotment increased migration, and he further argues that it represented "an attempted annihilation of our rightful relations with the land." These studies suggest that the Dawes Act and the subsequent sale and confiscation of allotments may have contributed to the initial waves of twentieth century Indian migration to urban areas.

Carlson (1981, pp. 155-157) contends that most Indians who were left landless as a result of allotment found work as farm laborers. While he does note that the percentage of Indians employed in agriculture dropped from 75% in 1910 to 65% in 1930, he emphasizes the fact that a majority of Indians remained in rural areas. However, McDonnell (1991, p. 113) notes that Indians who sold their land frequently had difficulty finding agricultural work with White homesteaders and ranchers, who often did not want to employ Indians. Although some landless Indians may have stayed close by, others moved far away from the reservation. When the Shawnee superintendent tried to track down people who had received fee patents without asking for them, he found that many of them had moved away and had not been heard from in years (ibid., p. 117). Based on interviews conducted in west coast cities, the Meriam Report noted: "Trips back to the reservation are not reported with great frequency. Some [interviewees] are from reservations far away and others are 'landless Indians'…" (Meriam, 1928, p. 719).

Within its chapter on relocation from reservations to cities, the Meriam Report (1928, p. 736) has a very brief section on "reasons for migration." The surface-level explanation given by virtually all interviewees was that economic conditions on migrant-sending reservations were difficult or, as the report bluntly states: "The alternative was starvation or pauperism." It is noteworthy that economic factors were the primary motivation for migration. However, below the surface level, a deeper explanation is hinted at: "sometimes it was said that the Indian office denied to Indians the right to work their own land because it was to be leased to Whites. The Indians, even if inclined to enjoy such enforced idleness, often found it impossible to live on the lease money. In some cases, the lessor would hire the Indians to work their own land, many times at a compensation inadequate to meet the cost of reservation living." The leasing of allotments, which had been allowed since 1891, was rife with instances of fraud and abuse. For reasons suggested by the quote above, leasing was often the first step toward the sale of Indian land to Whites (McDonnell, 1991, p. 60). Thus, while the report does not explicitly state that the allotment policy contributed to urban migration, it does imply that the way the allotment process was administered sometimes made farm life intolerable.

One might expect that a farmer who freely decides to leave the reservation and move to the city would, on average, be made better off by that decision. However, in the presence of uncertainty, migrants may not be able to accurately predict their urban living conditions in advance of moving. Fixico (2000, pp. 7, 15, 70) notes that many Indians found urban life to be unexpectedly difficult and some regretted moving to the city. He writes that "the first Indian migrants to the cities were unprepared to meet the demands of urbanization" (ibid., p. 187). Migrants with limited savings or relevant work experience are more likely to have trouble finding adequate housing and employment in the city. Urban migrants also oftentimes suffer

stress related to social isolation, adjustment to radically new living environments, and physical separation from tribal life (Snipp, 2004, p. 187). The Merriam Report documented cases where skilled Indians living in cities were underemployed (Meriam, 1928, pp. 669, 718, 729) and the interviews uncovered numerous instances where Indians had been subjected to overt job and housing discrimination (ibid., pp. 668, 715, 717). In many cities, long-standing racial prejudice against Indians likely complicated adaptation to urban life (Fixico, 2000, pp. 26-42).

Urbanization was the backdrop for the emergence of the Indian civil rights movement. In 1968, the American Indian Movement (AIM) was founded with the initial purpose of combatting discrimination against Indians in Minneapolis. Dennis Banks, a co-founder of AIM, explained to an interviewer that "[t]he American Indian Movement really began to express serious concerns [regarding the urbanization of Native Americans] when we realized that urbanization was part of the downfall, part of the destruction of the Indian community, and we have to go back and examine the reasons why Indian people were being forced off the reservations." He goes on to point out that reservations were initially designed as a means of confining Indians, but that they also represent "the only land that we have left" and that the process of seeking housing and employment in urban areas was often "dehumanizing for Indian people" due to discrimination (Banks, 1976, p. 30). Ironically, neighborhoods where Indians came to settle were "like reservations, but without land owned by urban Indians" (Fixico, 2000, p. 188). Even when urban migration did unambiguously improve welfare in comparison to post-allotment conditions back home, it is not clear whether it would have been preferable to the counterfactual scenario of living on unallotted, communally owned reservation land.

Just as allotment may have contributed to the American Indian population's increasing urbanization, it may have contributed to increased rural-to-rural migration as well. Scott Henry

Peters, an Ojibwe civil servant, explained how, as a child, his family had been forced to sell its allotment in Michigan to pay doctors' bills due to an outbreak of typhoid fever. Without a farm to live on, the family ultimately became reliant on itinerant farm work and seasonal logging for survival (LaPier and Beck, 2014). It is true that mobility and migration were deeply embedded in the traditions of many tribes (Howard and Lobo, 2013). However, such movements were typically voluntary and routine, whereas migration in the Dawes Era was not routine and may not have been entirely voluntary either. The anecdotal evidence summarized above suggests that the alienation of individual allotments may have reduced the ability of American Indian families to maintain permanent residence in their home communities. If true, this would be ironic, given that a major goal of the Dawes Act was to promote sedentary agriculture, thereby limiting the mobility of Indigenous groups (Greenwald, 2002, p. 7).

One of the Creek Nation's arguments against allotment was that it would "end in the absorption of our people by the great body of citizens in the United States" (quoted in Banner, 2005, p. 269). Pressure to assimilate was generally greater in cities than on reservations due to the immersion of urban Indians in an alien culture (Fixico, 2000, pp. 6, 172-189). The Meriam Report documented mixed opinions about the value of assimilation among urban Indians, with some advising their peers to "forget that you are Indian" whereas others "want more than the assurance of a steady wage in their newly acquired type of life; they would like to live on their own native lands" (Meriam, 1928, p. 721). Observations such as the latter raise questions about the conditions on reservations that would have made some Indians choose to migrate, even if they considered city life second-best. It could be that the first-best option, living on "their own native lands," was no longer a viable possibility for some, particularly if that land had been sold to White settlers as a result of the allotment process. To provide insight on these issues, the

empirical analysis that follows aims to determine the effect of allotment on American Indian migration patterns using data from the 1930 Census.

Methodology and Data

The mechanism by which allotment could lead to migration is suggested by the historical literature reviewed in the previous section. Multiple studies make clear that allotment was, in most cases, associated with the loss of Indian land (Akee, 2020; Banner, 2005; McDonnell, 1991; Carlson, 1981). Although some of those who lost their land stayed nearby, others found that they were not able to make a living on the reservation and left. Of course, some Indians on unallotted reservations also chose to migrate for reasons such as saving up money to buy farm implements or livestock, but they often returned after one or two years of off-reservation work (Meriam, 1928, p. 692). They could return to their reservation and count on having the right to use land, though not necessarily the same land they had used previously, because unallotted reservations remained inalienable common property (Carlson, 1981, pp. 85-88). By conferring on some Indians the right to alienate their land, the Dawes Act had, almost mechanically, increased the likelihood that formerly tribal land would be permanently alienated. Once the land was alienated, the right to return and use it was, of course, denied, and long-term migration in search of alternative sources of livelihood became more likely.

Questions specifically about migration were not incorporated into the decennial U.S. census until 1940 and, even then, they only pertained to migration within the previous 5 years (i.e., between 1935 and 1940). Also, there were no questions on the 1940 Census about tribal affiliation (Department of Commerce, 2002). Given the absence of census migration data for the Dawes Era (1887-1934), two proxies are constructed.

The first measure of migration used is simply an indicator of residence in a metropolitan area. For American Indians, the urban population share is sometimes used as an indicator of the extent of reservation-to-city migration, although this would be less valid for the period after World War II when an increasing proportion of urban Indians had lived their whole lives in cities (Eschbach, 2004, p. 80). Before 1934, Indian urbanization was still in its incipient stages, so it seems reasonable to use metropolitan residence as a proxy for urban migration. For example, the Meriam Report titled its chapter on urban Indians "Migrated Indians," implying an equivalency between urban residence and migration (Meriam, 1928, pp. 667-742). Special care must be taken to avoid counting the population of reservations located near cities as part of the urban population, and this issue will be discussed further below. The second measure of migration used is intended to capture rural-to-rural, as well as rural-to-urban, long-distance migration. It is an indicator for individuals whose current state of residence is different from their state of birth. Rosenbloom and Sundstrom (2004) take the same approach to proxy for migration in a study using census data from 1850 to 1990. One drawback of both definitions of migration is that they do not distinguish between long-term versus short-term migration.

Both measures of migration described above are dichotomous and are therefore modeled using a probit approach. The dummy variable for metropolitan residence is abbreviated *metro* and the dummy variable for inter-state migration is denoted *migrant*. Equations (2.1) and (2.2) provide the general functional form of the probit equations,

$$\Pr(metro_i = 1|a, \mathbf{x}) = \Phi(\beta_0 + \beta_1 a_i + \mathbf{x_i'}\boldsymbol{\gamma}) \quad (2.1)$$

$$\Pr(migrant_i = 1|a, \mathbf{x}) = \Phi(b_0 + b_1 a_i + \mathbf{x_i'}\mathbf{c}) \quad (2.2)$$

where *i* indexes individuals, *a* is a measure of exposure to allotment, **x** is a vector of control variables, and Φ is the standard normal cumulative distribution function. The key hypotheses are

$\beta_1 > 0$ and $b_1 > 0$. If true, that would provide evidence that greater exposure to allotment increases migration, as measured by the two proxies.

The hypothesis that allotment increased migration will be tested using 1930 Census data from the Integrated Public Use Microdata Series (IPUMS). One of the key variables for the analysis, tribal affiliation, is not available in the 1930 full count census data from IPUMS, so a 5% sample extracted from the full count census is used instead (Ruggles et al., 2022). Tribal affiliation is necessary to link individuals in the census to specific reservations and, hence, to estimate their likely exposure to allotment. The 1930 Census was chosen for the analysis mainly because it was the last decennial census of the 1887-1934 Dawes Era and was, therefore, more likely than earlier censuses to measure the full effects of allotment. By the time of the 1940 Census, federal Indian policy had already been thoroughly reshaped by the 1934 Wheeler-Howard Act, which abolished the practice of allotment and attempted to reverse its effects (Taylor, 1980). Thus, information captured in the 1930 Census is more likely than later censuses to isolate the effect of allotment from the effects of subsequent policies. The 1930 Census also appears to have somewhat more complete information on tribal affiliation than most censuses prior to 1970 (Department of Commerce, 2002).

In 1930, the Census Bureau classified cities or incorporated areas with populations of 2,500 or more as "urban" (Ruggles et al., 2022). Because that definition identifies many small towns as "urban," which is somewhat questionable, a definition based on metropolitan districts is preferable. The Census Bureau used metropolitan district classifications from 1910 to 1940, before switching to standard metropolitan areas (SMAs) with the 1950 census. Unlike SMAs, which were defined as groups of counties, metropolitan districts were composed of districts smaller than counties known as minor civil divisions (MCDs). The definition of metropolitan

districts used by IPUMS is based on the Census Bureau's definition. It includes cities with populations of 50,000 or more and MCDs with population densities of 150 people per square mile or more. Within each metropolitan district, IPUMS distinguishes between the central city, the urbanized fringe, and the outer fringe. The urbanized fringe consists of places contiguous to the central city that were either incorporated communities with populations of at least 2,500 or other places, which could be either incorporated or unincorporated, with population densities above 1,000 people per square mile. The urbanized area is comprised of the central cities plus the urbanized fringe (Gardner, 1999). For the purpose of this analysis, the *metro* variable is an indicator for residence in an urbanized area of a metropolitan district. Using just the urbanized area helps ensure that Indians residing on reservations near cities, such as the Puyallup reservation near Tacoma (Meriam, 1928, p. 726), are not coded as being urban migrants.

The other dependent variable, *migrant*, is a dummy variable that is equal to zero if the current state of residence is the same as the state of birth, and equal to one otherwise. The two dependent variables, *metro* and *migrant*, capture different aspects of mobility as illustrated in Figure 2.1. Those who migrate from a reservation to a metropolitan district within the same state are represented by the bottom-left quadrant. An example would be those who migrated from the White Earth reservation in northwestern Minnesota to Minneapolis (O'Brien, 2021; Shoemaker, 1988). Those who migrate from a reservation to a smaller, non-metropolitan area in a different state are represented by the top-right quadrant. An example would be Pueblo Indians from New Mexico working at shops around the Santa Fe Railroad depot in Winslow, Arizona (Meriam, 1928, p. 699). The two dependent variable definitions overlap in the bottom-right quadrant, which represents those living in metropolitan districts outside their home state. Of course, there are some migrants who are not covered by either of the dependent variable definitions (top-left

quadrant). However, such migrants are often different from other migrants, in that they may be more likely to work in towns or lumber camps on an irregular basis, maintaining regular contact with their home communities (Gray, 2021, p. 124; Meriam, 1928, pp. 686-687).

		migrant
	Same state Non-metropolitan	Different state Non-metropolitan
metro	Same state Metropolitan	Different state Metropolitan

Figure 2.1 Dependent variables definitions

The hypothesis is fundamentally about the effect of allotment on *voluntary* migration. The element of choice is important, despite the fact that migrants are often constrained by the absence of good alternatives. To ensure that the statistical data are well suited for testing the hypothesis, groups that had little or no choice in deciding where to live are excluded from the sample. Individuals who are institutionalized and soldiers living in army barracks cannot be said to have "migrated" in the standard sense of the word, even when they are living far from home. Likewise, boarding school students typically had limited power to decide where they went to school. By 1930, there were about 10,000 Indian children living in boarding schools in the United States (Gregg, 2018, p. 20). Because individuals confined to group quarters typically did not choose where to live, they are excluded from the estimation sample. Another group with limited control over relocation decisions is children. Because adults, rather than children, typically decide where the family unit will live, only individuals aged 18 and over are included in the estimation sample.

The key independent variables measure exposure to allotment. In order to assign values of those variables to individuals, it is necessary to link the individuals to specific reservations and then determine the extent to which allotment was implemented on those reservations. The census variable used to link individuals to reservations is tribal affiliation. In addition to tribal

identification, the 1930 Census also records data on race. Before 1960, census enumerators assigned race based on observation (Eschbach, 2004, p. 81). While this raises the possibility of biased results, the self-identification approach used from 1960 onward is also somewhat subjective (Newbold, 2004, p. 124). Within the 5% census sample, 17,777 individuals were identified as American Indian or Alaska Native. Of those, 15,644 claimed a specific tribal affiliation. This analysis will follow Snipp (1989, pp. 50-51), who considers the "core" American Indian population to consist of those whose race is identified as American Indian and who claim a tribal affiliation. The sample used in the subsequent econometric analysis consists of a subset of individuals belonging to that "core" group (those who could be linked to one or more specific reservations and who are at least 18 and not living in group quarters).

Although there are some tribes that can be matched one-to-one with reservations, there are other tribes with multiple reservations and some reservations shared by multiple tribes. There are also some tribes that never had a reservation prior to 1930. The main source of information used to match tribes with reservations is Tiller (1996). This source was also used by Dippel (2014) and the online dataset from that paper was used for cross-checking in some cases. Tribal websites containing historical information about reservations were also consulted to verify reservation-to-tribe matches. The following tribal affiliations from the census records could not be matched with reservations: Digger (California), Upper Skagit (Washington), Miami (Oklahoma), Brotherton (Wisconsin), Stockbridge (Wisconsin), Croatan (North Carolina), Shinnecock (New York), Narragansett (Rhode Island), and Penobscot (Maine). These tribes either had no reservation before 1930 or else occupied very small reservations which were not included in the main source of information about allotment (see below). "Digger" is not the name of a tribe, but rather an ambiguous catchall term for Indians from central California (or

southern California, or the Great Basin, depending on which source you consult). Lönnberg (1981) provides an analysis of this term, which he calls a "stereotype."

In addition to those tribes, individuals belonging to Indigenous groups based in Canada, Mexico, Alaska, and Hawaii are not included in the analysis because they were not directly impacted by the Dawes Act (Department of the Interior, 1935). Of the 15,644 individuals in the 5% census sample who stated a tribal identity, 1,510 were affiliated with Alaskan tribes, 30 belong to Canadian or Mexican tribes that had no reservation in the United States, 194 belonged to the nine tribes mentioned above that could not be associated with one or more reservations, and 32 were listed as "tribe not elsewhere classified" or "tribe not specified." The remaining 13,878 individuals could be matched with reservations for which allotment data are available. After removing individuals under age 18 and those living in group quarters, the final size of the sample used for estimation is 7,091 individuals affiliated with 122 census-defined tribal groups.

Once individuals are matched with reservations, the next step is to measure the degree to which allotment was implemented on those reservations. The allotment data are based on a 1935 report prepared by the Office of Indian Affairs (Department of the Interior, 1935). Leonard, Parker, and Anderson (2020) use the same report as the source of statistical information on which reservations were allotted and the date of the first major allotment. The data in Table VI of the 1935 report ("Basic Indian Land Statistics, 1934") were transcribed into a spreadsheet by the Native Land Information System (2022), which were then checked for accuracy and internal consistency. The table contains data for 199 individual reservations, 3 groups of reservations (Sacramento Agency Rancherías, Hoopa Valley Agency Rancherías, and the five southeastern tribes), and 5 groups of non-reservation settlements in California, Nevada, Oregon, and Washington. These data were assembled from statistical reports submitted by superintendents of

reservations and agencies and adjusted for accuracy using a variety of other federal government data sources regarding Indian reservations. Although this appears to be the most complete dataset available on the allotment status of reservations as of 1934, several adjustments are necessary in order to use the dataset in the econometric analysis.

First, the allotment data for reservations are for 1934, but the individual census records are for 1930. To make these two data sources comparable, the 1934 estimates are rolled back four years using additional data sources. Data on new allotments made after 1930 were obtained from the annual reports of the Commissioner of Indian Affairs for 1931 and 1932 (Department of the Interior, multiple years). Another useful source, which is referenced in the notes to Table VI in the 1935 document, is a statistical report by the Office of Indian Affairs entitled "General Data Concerning Indian Reservations," and dated October 15, 1929 (Department of the Interior, 1930). Relatively few new allotments were issued after 1930. The Department of the Interior effectively stopped assigning new allotments in early 1933 (Taylor, 1980, p. 18) and, even before 1933, allotment was already on the decline (see Figure 2.1 in Carlson, 1981, p. 30). Perhaps more important than accounting for new allotments after 1930 is accounting for new land area *added* to reservations in this period. Fortunately, the 1935 report does identify the date when each reservation was established. Using this information, plus data on new land acquisitions from the annual reports of the Commissioner of Indian Affairs, it is possible to reconstruct the land area belonging to reservations as of 1930.

The second adjustment concerns the five southeastern tribes, the Cherokee, Chickasaw, Choctaw, Creek, and Seminole, whose data are aggregated into a single entry in the 1935 report. Disaggregated figures for those tribes are obtained from the previously cited statistical report dated October 15, 1929 (Department of the Interior, 1930). Third, the 1935 report includes no

allotment information for the Hoopa Valley reservation (California). Appendix C of Dippel and Frye (2020), however, lists that reservation as having been at least partially allotted. That conclusion is supported by information on allotments obtained from the annual reports of the Commissioner of Indian Affairs in the 1890s (Department of the Interior, multiple years). The above referenced 1929 statistical report indicates that about 22% of the Hoopa Valley reservation had been allotted by that date (Department of the Interior, 1930), and information from the latter report is therefore used for this particular reservation.

Fourth, most non-reservation Indian lands are excluded from the analysis because it is not possible to determine which tribes they are associated with. The names of these jurisdictions are "Indian Homesites" and "Scattered Bands" (California), "Fourth Section Allottees" (Oregon), and "Unattached" (Washington). The only exception is the "Nonreservation" jurisdiction of the Carson Valley Indian Agency, assigned to the Paiute and Washoe tribes (Nevada). This is the only source of information in the 1935 report on lands likely belonging to members of the Washoe tribe. The Washoes received allotments near Lake Tahoe after 1893, despite the fact that the tribe had not been granted a reservation (Makley, 2018, pp. 86-88). Because the timing and location of these non-reservation allotments recorded in the 1935 report match closely with the historical record for the Washoe tribe, they are attributed to that tribe.

After making the adjustments described above, one reservation was omitted from the sample because it was established after 1930, leaving 198 out of the original 199 reservations that were listed individually in the 1935 report. Also, as described above, data for the Cherokee, Chickasaw, Choctaw, Creek, and Seminole reservations, which had been combined in the 1935 report, are disaggregated for 5 separate reservations. Data for the two composite groups of California rancherías in that report are not disaggregated due to insufficient detail in the various

government records consulted. These two groups of rancherías are counted as two reservation-equivalents for the purpose of the statistical analysis. Finally, the non-reservation allotments of the Washoe tribe are counted as another reservation equivalent. This is consistent with the practice in the 1935 report of including data on allotments even for tribes that did not have a reservation. As in Carlson (1981, p. 48), reservations allotted by treaty prior to 1887 are included in the sample. The procedure outlined above was used to generate a dataset of 206 reservations or reservation-equivalents. Some of the smaller reservations correspond to tribes that are not represented in the census subsample used for the econometric analysis.

Four measures of exposure to allotment are used: (1) *land loss* is the amount of land ceded or allotted by 1930 as a percentage of the initial size of the reservation; (2) *pct allotted* is the acreage allotted as a percentage of the initial reservation size (ignoring the amount of land ceded or declared as "surplus"); (3) *allotted* is a dummy variable for reservations that were ever allotted, even if the allotment only affected part of the reservation; and (4) *time since* is the number of years since the allotment process began on each reservation, estimated using a variable called "dates of major allotments" in the 1935 report. Leonard, Parker, and Anderson (2020) also use data from the same 1935 Department of the Interior report to determine which reservations were allotted, equivalent to (3) above, and the date of the first major allotment, which is the basis for constructing variable (4) above. Variables (1) and (2) are included in this analysis because they provide finer-grained detail on the extent to which allotment was implemented on particular reservations. This is important because, on some "allotted" reservations only a small fraction of the reservation was actually allotted (e.g., only 6% of Navajo reservation lands), whereas other reservations were 100% allotted.

One practical question that arises in assigning values of allotment exposure to individuals is how to estimate exposure for individuals whose tribal affiliation is associated with multiple reservations. For example, tribal affiliation is sometimes coded using broad categories such as Apache or Sioux that correspond to several different reservations. The approach taken is to calculate *land loss* and *pct allotted* as the sum of acreage ceded or allotted across all of those reservations as a percentage of the aggregate initial acreage of those reservations. This approach assigns greater weight to larger reservations, which is appropriate given that the focus of the analysis is on the loss of reservation land. The variable *allotted* is coded as 1 for individuals whose tribe is associated with one or more allotted reservations and the variable *time since* is the number of years since the earliest year that allotment began on any of those reservations. When a single tribal identity is associated with multiple reservations, all of the allotment exposure metrics are necessarily less precise, but the decrease in precision is amplified for variables (3) and (4), as compared to variables (1) and (2).

The selection of control variables is informed primarily by previous literature. The Meriam Report suggested that the better educated were more likely to migrate to cities (Meriam, 1928, p. 671). Although the 1930 Census did not include information on educational attainment, it did include a question on literacy (Department of Commerce, 2002). For the purpose of the econometric analysis, a person is defined as "literate" if they can both read and write. Akee (2020, p. 132) finds evidence that those who lost their allotments on the White Earth reservation tended to be younger and male, suggesting that both age and sex might mediate the relationship between allotment and abandonment of farming. This suggests, in turn, that both variables are important controls for studying the allotment-migration nexus. Age and gender are therefore employed as control variables. Mincer (1978) also argues that married individuals are less likely

to move than singles, other things equal. To examine whether that is the case for this sample, marital status is included as an additional right-hand-side variable. Finally, a dummy variable is constructed to indicate the presence of one or more children in the household. The Meriam Report indicated that the desire to keep children in city public schools was a factor inhibiting return migration (Meriam, 1928, p. 737).

Table 2.1 Descriptive statistics

Variable	Description	Sample Mean
Metro	= 1 if living in an urbanized metropolitan area, 0 otherwise	1.51%
Migrant	= 1 if not residing in home state, 0 otherwise	11.55%
Land loss	Percentage of original reservation area allotted or ceded	66.56%
Pct allotted	Percentage of original reservation area allotted	50.68%
Allotted	= 1 if reservation was ever allotted, 0 otherwise	92.84%
Time since	Number of years (as of 1930) since the first major allotment	30.87
Literacy	= 1 if able to read and write, 0 otherwise	68.59%
Female	= 1 if female, 0 otherwise	47.95%
Married	= 1 if married, 0 otherwise	66.49%
Age	Age in years	38.43
Children	= 1 if one or more own children in the household, 0 otherwise	57.95%

Note: Mean values are estimated from a 5% 1930 Census sample using data for 7,091 American Indians aged 18 and older, not living in group quarters, who could be linked with reservations for which allotment data are available. The sample used to generate these estimates is the same as the sample used to estimate regression equations.

Table 2.1 includes descriptions and mean values for the dependent and independent variables. Estimates are obtained using person weights generated by IPUMS for the 5% sample extracted from the 1930 Census (Ruggles et al., 2022). The sample is restricted to the same 7,091 individuals who are the focus of the subsequent econometric analysis. Although, as already mentioned, 9.9% of all American Indians in 1930 lived in urban areas (generally defined as cities of 2,500 or more inhabitants), only 1.5% of those in the estimation sample live in urbanized areas of metropolitan districts. The difference is almost entirely due to the fact that

metro excludes many of the small towns included under the "urban" definition. By contrast, nearly 40% of the national population lived in urbanized areas of metropolitan districts in 1930. The share of inter-state migrants in the estimation sample is 11.5%. The allotment exposure variables should be interpreted with caution because they are averages over individuals in the sample, rather than averages for reservations. However, they convey the point made earlier that allotments and cessions removed a large amount of land from tribal control. The average age is 38, which is fairly young considering that no one under age 18 was included in the sample.

Empirical Results

Because the 5% census sample used for estimation does not represent the complete population of interest, the subsequent analysis uses the survey weights for individuals provided by IPUMS. The primary sampling unit used comprises household clusters because errors are likely to be correlated within household units. Table 2.2 shows probit regression results for four variants of equation (2.1) where the dependent variable equals one for individuals living in the urbanized areas of metropolitan districts and zero otherwise. Each of the four specifications shown in the table uses a different definition of exposure to allotment, but the control variables used for each specification are identical. After some experimentation with different functional forms, a variable representing the square of age was included as an additional control because the effect of age on migration probabilities appears to be nonlinear. The *F*-statistics suggest that the overall explanatory power of the right-hand-side variables is fairly low.

All four measures of exposure to allotment are positively related to the probability of living in the urbanized area of a metropolitan district. However, only the percentage of reservations allotted (*pct allotted*), and the percentage allotted or ceded (*land loss*), exert

Table 2.2 Determinants of residency in urbanized areas of metropolitan districts

	(1)	(2)	(3)	(4)
Land loss	0.00941***			
	(0.00260)			
Pct allotted		0.00724***		
		(0.00219)		
Allotted			0.24207	
			(0.23431)	
Time since				0.00243
				(0.00318)
Literacy	0.20709	0.27504	0.43367***	0.42542**
	(0.18881)	(0.18789)	(0.16711)	(0.17032)
Female	0.09437	0.09949	0.11203	0.11353*
	(0.06986)	(0.06812)	(0.06844)	(0.06866)
Married	0.01441	0.01578	0.00242	0.00569
	(0.12503)	(0.12506)	(0.12397)	(0.12417)
Age	0.03579*	0.03504*	0.03391*	0.03358*
	(0.02050)	(0.02016)	(0.01921)	(0.01916)
Age^2	-0.00043*	-0.00041	-0.00039	-0.00038
	(0.00026)	(0.00025)	(0.00024)	(0.00024)
Children	-0.24170**	-0.22944**	-0.22537**	-0.22612**
	(0.11248)	(0.11241)	(0.11051)	(0.11095)
Constant	-3.66650***	-3.42299***	-3.31109***	-3.14791***
	(0.39608)	(0.39256)	(0.41229)	(0.35602)
F-statistic	4.39***	4.00***	2.27**	2.52**
Observations	7,091	7,091	7,091	7,091

Notes: Standard errors are in parentheses. The dependent variable is *metro*. Individuals under age 18 and those living in group quarters are excluded from the estimation sample.
* $p < .10$, ** $p < .05$, *** $p < .01$

statistically significant impacts. As discussed in the methodology section, those two variables likely provide somewhat more fine-grained measures of an individual's likely exposure to allotment because they are continuous percentages of reservation land area rather than binary or count variables. The positive coefficients on the allotment-related variables provide some support for the hypothesis that allotment increased the probability of migration.

Literacy is a significant predictor of urban residency in models (3) and (4). This might reflect a greater propensity of educated individuals to migrate to cities (Meriam, 1928, p. 671). It also indirectly relates to research on much more recent migration from Indian reservations which suggests that individuals with a high school diploma are more likely to migrate off the reservation (Geib, 2001). The fact that the literacy coefficients are only statistically significant in specifications that use coarser, or less fine-grained, indicators of exposure to allotment is likely due to a positive correlation between the degree of assimilation and the extent of communal land loss. Gender and marital status do not appear to be strong predictors of urban migration in this sample. However, the fact that all four *female* coefficients are positive, and one is significant at the 10% level, does not confirm the expectation that urban migrants were more likely to be male. One reason that Indian women might be more likely than men to migrate to cities is the work of "outing matrons" employed by the Office of Indian Affairs, who were responsible for finding urban work, often as domestic servants, for women from reservations (Meriam, 1928, pp. 686, 712; Haskins, 2012).

Age is a significant predictor at the 10% significance level, but not at the 5% level. The estimates suggest that the probability of living in an urbanized area increases with age for young adults, peaks around the age of 42 to 44, and subsequently decreases. The Meriam Report suggested that young people are the most likely to move to cities which, at first blush, seems

inconsistent with the positive *age* coefficients shown in Table 2.2 (Meriam, 1928, p. 678). However, age is also correlated with family formation. The coefficient on *children* indicates that the presence of children in a household significantly decreases the probability of living in an urbanized area. The negative sign of the coefficient on *children* might help explain the discrepancy between the positive coefficient on *age* and the observation of researchers in the field that the young were more likely to migrate to cities. The propensity to migrate that the Meriam Report attributed to youth may rather have been driven by the absence of childcare responsibilities for families with no children. In any case, it seems that the households in metropolitan districts were less likely to have children.

Probit estimates for variants of equation (2.2) are shown in Table 2.3. The dependent variable in this case is equal to one for individuals whose state of residence is different than their state of birth. It is reassuring that the signs of all the coefficients are the same for this measure of migration as for the metropolitan-residence-based measure. Again, all four indicators of exposure to allotment have positive coefficients. In this case, however, three of those coefficients are statistically significant at the 1% level and the fourth coefficient is statistically significant at the 10% level. Literacy again exerts positive effects on the probability of migration and is now statistically significant in all four specifications. Gender and marital status do not have any discernible impact. The effect of age is nonlinear, as was the case for urban migration, but now the tipping point is estimated much higher, near 100. This suggests that the impact of age on the probability of inter-state migration was monotonically increasing at a decreasing rate over the relevant range of ages. Interestingly, the effect of *children* on inter-state migration is statistically insignificant.

Table 2.3. Determinants of inter-state migration

	(1)	(2)	(3)	(4)
Land loss	0.00524***			
	(0.00084)			
Pct allotted		0.00320***		
		(0.00071)		
Allotted			0.28390*	
			(0.15753)	
Time since				0.00911***
				(0.00261)
Literacy	0.11440*	0.20204***	0.28269***	0.24609***
	(0.06519)	(0.06437)	(0.06302)	(0.06309)
Female	0.01640	0.02540	0.03104	0.02947
	(0.03656)	(0.03649)	(0.03639)	(0.03649)
Married	0.01421	0.02031	0.01075	0.01481
	(0.05917)	(0.05872)	(0.05811)	(0.05826)
Age	0.02651***	0.02606***	0.02662***	0.02601***
	(0.00649)	(0.00639)	(0.00634)	(0.00639)
Age^2	-0.00014**	-0.00012*	-0.00012*	-0.00012*
	(0.00007)	(0.00007)	(0.00007)	(0.00007)
Children	-0.03947	-0.04150	-0.03807	-0.03480
	(0.05535)	(0.05457)	(0.05458)	(0.05511)
Constant	-2.45910***	-2.33579***	-2.50500***	-2.48470***
	(0.15492)	(0.14510)	(0.21206)	(0.16213)
F-statistic	18.52***	18.48***	17.02***	17.34***
Observations	7,091	7,091	7,091	7,091

Notes: Standard errors are in parentheses. The dependent variable is *migrant*. Individuals under age 18 and those living in group quarters are excluded from the estimation sample.
* $p < .10$, ** $p < .05$, *** $p < .01$

Because the probit coefficients are not easily interpreted in quantitative terms, marginal effects are reported in Table 2.4 for the key variables. While the effect of allotment appears to be larger in the case of inter-state migration, as compared to metropolitan migration, that conclusion needs to be qualified by the fact that *metro* has a much lower mean value than *migrant* (Table 2.1). A 10 percentage-point increase in *land loss* would be expected to increase the probability of residing in an urbanized area by 0.0034. This seems like a small change, but it represents a 23% increase over the mean probability value of 0.0151. Stretching the interpretation of marginal changes a bit, a 50 percentage-point increase in *land loss* would more than double the probability of residing in an urbanized area. A 10 percentage-point increase in *land loss* would increase the probability of inter-state migration by 0.0097, but that is only 8% of that variable's mean value of 0.1155. While exposure to allotment affects both urban migration and inter-state migration, in *proportional* terms it is more important for the former. The impact attributed specifically to allotment is probably better measured by the marginal effect of *pct allotted*, which is a bit smaller but still economically significant.

The results in Table 2.4 support the hypothesis that allotment and the distribution of "surplus" land under the Dawes Act increased migration. The mechanisms by which it did so are probably quite complex. As has already been suggested, the Dawes Act likely stimulated migration by directly instigating land loss, whether through voluntary sales or the seizure of land for non-payment of taxes and debts. It could be that reservations that were allotted were also inundated with other administrative and legal problems as a consequence of allotment. One recurring theme in the Meriam Report's discussion of urban Indians is that many of them were enmeshed in conflicts and legal disputes with the Indian Service over the control of land on reservations (Meriam, 1928, p. 671, 737). The complex issues surrounding the surveying, titling,

leasing, and inheritance of allotments may have generated many of those conflicts. For a variety of possible reasons, it appears that the dislocation induced by the allotment of reservations was a major cause of urban and inter-state migration in the years leading up to 1930.

Table 2.4 Estimated marginal effects for the key explanatory variables

	Metro	*Migrant*
Land loss	0.00034***	0.00097***
	(0.00011)	(0.00015)
Pct allotted	0.00026***	0.00060***
	(0.00008)	(0.00013)
Allotted	0.00899	0.05348*
	(0.00886)	(0.02935)
Time since	0.00009	0.00171***
	(0.00012)	(0.00048)

Notes: Standard errors are in parentheses. The marginal effects were estimated on the basis of the probit estimates shown in tables 2.2 and 2.3.
* $p < .10$, ** $p < .05$, *** $p < .01$

It is reasonable to assume that most of those who migrated away from reservations did so primarily to improve their standard of living (Meriam, 1928, p. 736). This implies a comparison of the net economic benefits of remaining on the reservation versus the net benefits of moving. The argument developed in the historical analysis is that the effect of allotment on migration operated primarily by reducing the net benefits of remaining on allotted reservations, as compared to unallotted reservations. In other words, urban life may have been preferable to living with the effects of allotment, even if it was *not* preferable to living on an unallotted reservation. Hence, reservations that were deeply impacted by allotment generated relatively larger emigration flows, other things equal.

Of course, if one could expect a very large increase in one's standard of living by moving to a city, then migration may have been desirable across the board, for the inhabitants of all reservations and, in that case, the reasoning above would be invalid. One argument for why migrants would *not* expect vastly higher standards of living in urbanized areas or other off-reservation destinations concerns the types of jobs available to them. Due to discrimination and other factors, Indians often did not have easy access to good urban jobs (Carlson, 1981, p. 91; Banks, 1976, p. 30). Because the census includes occupation data, it is possible to examine what types of jobs migrants could expect to get. Given that the 1930 Census contained more than 200 occupational categories organized in a somewhat haphazard way, it is desirable to have a way of aggregating occupations into cohesive groups that can be easily summarized. The method used is that applied by Woytinsky (1937) in an economic study of 1930 Census data prepared for the Committee on Social Security of the Social Science Research Council. The study distributes census occupations into 8 "classes of work," which are the basis of the analysis that follows.

Table 2.5 shows the results tabulated for workers in the estimation sample who lived in urbanized areas of metropolitan districts and those who lived outside those areas. The small size of the urbanized sample is further reduced by excluding non-workers and workers with missing occupation data, so the estimated percentage shares may not be very precise. Farm proprietors are included in the first class of workers (employers and self-employed persons), which helps explain why that class constitutes such a large share of the non-urban subsample (37%). Furthermore, wage-earning farm laborers are included in class 7 (unskilled manual labor), which clarifies why that category also represents a large share (32%) of the rural workforce. Woytinsky (1937, p. 33) notes that farm hands were categorized by the United States Employment Service as semi-skilled production workers, but he nonetheless classifies them as unskilled workers. The

classification of wage-earning farmers as "unskilled" is inevitably somewhat arbitrary. Class 2 (unpaid family workers) is comprised exclusively of unpaid farm laborers who are generally members of the farmer's family (ibid., p. 28).

Despite the various issues described in the preceding paragraph, Table 2.5 sheds light on the nature of urban work for American Indians in 1930. Classes 5 through 8 can be considered roughly "blue-collar" occupations ("service" occupations include servants, janitors, cooks, etc. and that category does not include service professionals). About 76% of the urbanized subsample is employed in those blue-collar occupations. It should also be noted that class 4 (salaried employees) also includes some occupations, like store clerks, that could be considered blue-collar. In the non-urbanized subsample, only 50% of workers are in the blue-collar occupations. Comparisons between urban and rural areas are hazardous, since the term "blue collar" may have little meaning in an agricultural context. However, the data suggest that few Indians living in cities in 1930 had professional or managerial jobs. Table 2.6 provides a somewhat different perspective on the same subject. It shows tabulations based on a variable in the 1930 Census called "class of worker." More than 81% of workers in cities earned a living from wage labor, compared to 47% in non-urbanized areas. A much larger percentage of non-urban workers were independent producers.

Further insight can be gained by looking at the largest occupations within the *metro* subsample. The top two census-defined occupations in that sub-population are "laborers, not elsewhere specified" and "servants, other domestic and personal service." The fact that laborers are defined generically, without reference to particular job functions, attests to the "unskilled" nature of much of that work (Woytinsky, 1937, p. 33). It is worth recalling that many skilled and educated Indians who sought work in cities ended up underemployed (Meriam, 1928, pp. 669,

718, 729). The importance of servants in the urban sample may be partly a result of the work of "outing matrons" in bringing young women from reservations to urban areas to work in domestic service (Haskins, 2012). While some individuals in the sample clearly achieved professional success in cities, the qualitative impression from the data is that the large majority of American Indians living in cities in 1930 made a living from manual labor.

Table 2.5 Workers by urban/rural status and class of work

		Metro		Non-*Metro*	
Class	Description of Class	Freq.	Percent	Freq.	Percent
1	Employers and Self-Employed Persons	4	5.97	1,362	37.00
2	Unpaid Family Workers	0	0.00	302	8.20
3	Professional Persons	3	4.48	90	2.44
4	Salaried Employees	9	13.43	88	2.39
5	Skilled Manual Labor	15	22.39	152	4.13
6	Semi-Skilled Manual Labor	8	11.94	354	9.62
7	Unskilled Manual Labor	16	23.88	1,181	32.08
8	Service Workers	12	17.91	152	4.13

Notes: The table excludes non-workers, individuals under age 18, those living in group quarters, and those for which allotment data are unavailable. The variable *metro* is defined the same way as the dependent variable in the regressions reported in Table 2.2. The definitions of "class of work" are from Woytinksy (1937, pp. 18; 27-33). Survey weights were not used in generating these estimates.

Table 2.6 Workers by urban/rural status and class of worker

	Metro		Non-*Metro*	
Class of Worker	Freq.	Percent	Freq.	Percent
Employer	2	3.08	114	3.18
Working on Own Account	10	15.38	1,440	40.14
Works for Wages	53	81.54	1,689	47.09
Unpaid Family Worker	0	0.00	344	9.59

Notes: See the notes for Table 2.5. Class of worker is a variable in the 1930 Census. Missing values are omitted from the tabulation.

The same approach can be used to generate tabulations for inter-state migrants versus individuals who live in the state where they were born. Those results are shown in tables 2.7 and

2.8. The main difference in these tables is that people who moved across state lines were often rural-to-rural migrants and many of them continued to farm. However, inter-state migrants, like urban migrants, are less likely to be proprietors (31% of migrants were proprietors versus 37% of non-migrants) and they are more likely to be engaged in low-end service jobs (Table 2.7). Inter-state migrants are also more likely to work for wages (61% versus 46%) and less likely to be independent producers, as indicated in Table 2.8 (note that data on employers and self-employed workers from Table 2.7 do not match those implied by Table 2.8 because the former are based on occupation data and the latter are captured by a separate census question). The top non-farm occupations for inter-state migrants are "laborers, not elsewhere specified," "operatives, not elsewhere specified," and "servants, other domestic and personal service." Woytinsky (1937, p. 32) classifies manufacturing and mechanical operatives as semi-skilled workers. In short, the types of non-agricultural jobs performed by inter-state migrants are not much different from those done by urban migrants.

Table 2.7 Workers by inter-state migration status and class of work

		Migrant		Non-*Migrant*	
Class	Description of Class	Freq.	Percent	Freq.	Percent
1	Employers and Self-Employed Persons	137	31.21	1,229	37.14
2	Unpaid Family Workers	23	5.24	279	8.43
3	Professional Persons	9	2.05	84	2.54
4	Salaried Employees	23	5.24	74	2.24
5	Skilled Manual Labor	35	7.97	132	3.99
6	Semi-Skilled Manual Labor	34	7.74	328	9.91
7	Unskilled Manual Labor	140	31.89	1,057	31.94
8	Service Workers	38	8.66	126	3.81

Notes: See the notes for Table 2.5. The variable *migrant* is defined the same way as the dependent variable in the regressions reported in Table 2.3.

Table 2.8 Workers by inter-state migration status and class of worker

	Migrant		Non-*Migrant*	
Class of Worker	Freq.	Percent	Freq.	Percent
Employer	18	4.23	98	3.04
Working on Own Account	129	30.28	1,321	40.95
Works for Wages	258	60.56	1,484	46.00
Unpaid Family Worker	21	4.93	323	10.01

Notes: See the notes for tables 2.6 and 2.7.

To review, tables 2.2 to 2.4 indicate that exposure to allotment increased the probability of urban and inter-state migration. This contributes to the literature by describing one of the less studied consequences of allotment and one of the factors contributing to early-twentieth-century American Indian migrations. The purpose of tables 2.5 to 2.8 is to show that migration itself was far from being a ticket to economic success. Both in cities and on reservations, the occupations of most American Indian workers involved manual labor. The main difference was that urban work was characterized by wage labor, in which workers were subordinated to bosses and lacked the self-direction that many farmers on reservations had possessed as independent producers. Furthermore, Carlson (1981, pp. 155-157) emphasizes that most allottees who lost their land did not enter higher-paying occupations.

The overall conclusion from the statistical analysis, combined with qualitative evidence from sources such as the 1928 Merriam Report, is that Indian migration to distant towns and cities was not accompanied by a mass transition into the middle class. It is true that economic hardship on reservations was a major cause of migration, but it is equally true that poor economic conditions on allotted reservations were at least partly the consequence of allotment. The allotment of reservations can be seen as a push factor since it potentially affected the costs and benefits of staying in the same location. It most likely would not have changed what off-reservation destinations have to offer, so it is not a pull factor. While it is impossible to know

with certainty whether individuals who migrated away from allotted reservations would have stayed had their reservation never been allotted, the fact that exposure to allotment exercises an independent positive impact on the probability of migration suggests that it did motivate outmigration by raising the cost, or reducing the benefit, of staying.

Conclusion

According to the Meriam Report (1928, p. 7): "When the government adopted the policy of individual ownership of the land on the reservations, the expectation was that the Indians would become farmers." A major objective of the policy was to encourage sedentary agriculture, which necessarily entailed limiting mobility (Greenwald, 2002, p. 7). The stated goal was not for Indians to lose their land and migrate to cities or other states. In that sense, this analysis adds to numerous previous studies finding that the Dawes Act did not achieve its stated purpose. It is possible, of course, that migration may have contributed, in a roundabout way, to fulfilling the policy objective of increasing interaction with White society. However, a key element of the original assimilationist policy was that Indians would enter White society as property owners and independent farmers. Instead, many of them arrived in cities and towns as migrants seeking to escape the unfortunate economic consequences of allotment and land loss. Furthermore, even if allotment did contribute to achieving assimilationist goals by weakening tribal bonds for some individuals, it is crucial that such objectives were not shared by many of the policy's intended beneficiaries (Black, 2015, pp. 103-141; Carlson, 1981, p. 108).

The empirical analysis provides support for the argument that allotment and associated land loss contributed to out-migration from reservation areas. In a sense, allotment was the culmination of more than a century of confiscatory policies that whittled the Indian land base

down to a tiny fragment of its original size (Carlos, Feir, and Redish, 2022). In this phase of dispossession, the theft of "surplus" land was combined with the alienation of allotments largely through routine market transactions (although overt land fraud played a role too). As with colonial land sales by Indians to Whites, outwardly voluntary business deals leading to Indian land loss were often conditioned by a very uneven economic playing field (Banner, 2005). Furthermore, those transactions were only possible due to a major institutional change in the form of the Dawes Act. By blocking off the possibility of tribal cooperative approaches to economic development in favor of the forced imposition of individual property ownership, the Dawes Act created the conditions for mass dispossession. One side effect of the privatization of communal property was increased out-migration. In recent decades, as tribes have implemented economic development projects that often conflict with the individualistic spirit of the Dawes Act, there has been considerable return migration, from cities back to reservations (Snipp, 2004, pp. 185-186). If the breakup of communal property caused outmigration, perhaps the return of tribe-sponsored development will have the opposite effect.

It is often argued that people in developing countries who migrate to cities to take low-wage factory jobs do so because those jobs are better than the alternatives available in the countryside. This study suggests that the "bad" alternatives that cause countryfolk to seek work in the city may themselves be the results of particular policy choices rather than being intrinsic to country life. Substantial historical evidence suggests that allotment made life difficult on the reservations it affected, and it led to land loss (Akee, 2020; Banner, 2005; McDonnell, 1991; Carlson, 1981). The empirical results indicate that Indians from reservations that were more exposed to allotment were more likely to migrate. Thus, reservation-to-city migration in the Dawes Era was not simply a story of life in the city being more economically rewarding than life

on the reservation. Rather, it was, at least in part, a story about the consequences of a transformation in rural life wrought by the privatization of communal property. Allotment worsened the value of the alternative to urban life by making it harder to earn a living on one's own reservation. This has relevance to developing countries, where policies aimed at privatizing communal resources sometimes lead individuals to choose urban factory work. Even if they would have preferred to earn a living from their ancestral communal property, that is often no longer an option due to changes in legal institutions that accompany the spread of capitalism.

Chapter 3: Property Institutions and Income Inequality in Mexico

Introduction

In an influential book, Hernando de Soto (2000, pp. 34-35) argued that many of the assets belonging to the urban and rural poor in developing countries are "dead capital" because they cannot be leveraged to generate wealth. In particular, he notes that farm plots distributed to peasants through land reform projects in developing nations often lack "the property representations necessary to create capital" (ibid., p. 218). For example, the land cannot be pledged as collateral for loans because it cannot be legally seized in the event of a default. Other scholars point out that land reform policies in many countries also limited the right of farmers to sell property created by redistribution (Albertus et al., 2016). In the case of Mexico, twentieth-century agrarian reform created a type of communal property known as the *ejido* that could not be legally mortgaged or sold. After constitutional reforms in 1992, however, the rules changed to allow *ejido* land to be privatized, conditional upon the approval of the farmers holding communal land rights (called *ejidatarios*). Some *ejidos* voted to privatize their land, although the majority opted to maintain communal property ownership (Romero, 2015).

The policy reforms of this period provide a natural laboratory for studying the social consequences of communal versus private property institutions. In neoclassical economics, private property rights are often viewed as a means of internalizing externalities that can arise from the overexploitation of common-pool resources (Coase, 1960; Demsetz, 1967). Economic arguments for strengthening private property rights, often at the expense of communal property rights, have been very influential in global policy circles and were a major force behind the 1992 reforms in Mexico (Appendini, 2020). Free market advocates like de Soto consider prohibitions

on mortgaging or selling communal property to be inexcusable handicaps limiting the economic potential of peasants' valuable land and relegating it to the status of "dead capital." However, the safeguards that insulate communal property from market forces were imposed by design, not by accident. As de Soto himself acknowledges (2000, p. 55) "a great part of the potential value of legal property is derived from the possibility of forfeiture." Lifting restrictions on the alienation of communal property may enliven rural real estate markets and increase economic efficiency, but it also raises the risk of dispossession.[1]

While the 1992 reforms modified the regulation of communal property in many ways, it continues to be the case that a major difference between *ejidos* and private property is that the latter can be freely bought and sold on the market (without being privatized first). To formulate a hypothesis regarding the possible social consequences of the 1992 reforms, this analysis will delve deep into Mexican history and scrutinize a nineteenth-century attempt to privatize communal property. The outcomes of that experiment may have included some of the efficiency gains that de Soto's argument would imply, but the most important result, with the benefit of hindsight, was a significant increase in economic inequality that contributed to the Mexican Revolution and, indirectly, to the emergence of *ejidos*. Some of the peculiarities of *ejido* property, such as the prohibition on sales, owe their existence to the legacy of dispossession that they were designed to redress. The hypothesis emerging from Mexican history is that the privatization of communal property increases inequality. After investigating the history of

[1] De Soto (2000, p. 216) seems to be referring to this fact when he says: "Admiration for good property systems should not blind us to the fact that, as Marx noted, these systems can also be used for theft" but he argues that safeguards presently exist that make primitive accumulation difficult. Although he usually advocates "formal" property, rather than "private" property, in most contexts he seems to mean the latter (see, for example, p. 64) and he criticizes legal pluralism, where different property regimes coexist (p. 53).

Mexican property institutions and briefly reviewing research on inequality in Mexico, the analysis will test the above hypothesis using data from 1990 to 2010.

A Brief History of Property Institutions in Mexico

Pre-Hispanic and Colonial Property Institutions

The Spanish conquest, more than any other event in Mexican history, contributed to a highly unequal distribution of land. Engerman and Sokoloff (2002, pp. 57-60) argue that factor endowments, and particularly the existence of a large labor endowment in Mexico prior to the conquest, help explain that country's high degree of inequality compared to other European colonies further north. Whereas England's northern colonies came to be characterized by small family farms and a fairly egalitarian distribution of resources, Mexico developed a highly inegalitarian land distribution soon after the initial conquest. In this view, the large labor endowment in Mexico led the Spanish to institute policies oriented towards labor exploitation rather than promoting European immigration and settlement on a large scale. Acemoglu, Johnson, and Robinson (2002, pp. 1232-1235) provide a similar analysis, though they emphasize institutions more than geographic factors. In regions of the world, including Mexico, that had relatively high population density in 1500, Europeans imposed extractive institutions that benefited small elites. In contrast, countries like the United States, that had low population density in 1500, tended to develop "institutions of private property."

However, a slightly different interpretation is also possible. In the alternative view, England's colonies created a *tabula rasa* for a nation of small proprietors embracing strong protections on private property rights only by forcing Indigenous peoples off their land and obliterating pre-conquest property lines (DuVal, 2006, p.7). Spain, in contrast, was unable to

completely ignore pre-conquest property rights in the process of subjugating advanced states like the Aztec and Inca empires, resulting in a more accommodative stance (Jordan, 2009, p. 36). Both views capture different aspects of reality (see, for example, Herzog, 2013; Quijano, 2000; Pagden, 1995, pp. 73-102). In many ways, property rights in colonial Mexico were characterized by a tension between accommodation of Indigenous institutions and pressure from Europeans to accumulate wealth by exploiting land and Indigenous labor. As stated by Bartra (1993, p. 82), "[t]he colonial bond was founded, in part, on the exploitation of the community: for that very reason, the state was interested in impeding the community's dissolution." It was this paradoxical imperative that resulted in both a high degree of land inequality *and* the partial survival of pre-Hispanic property rights institutions in Mexico.

Agriculturalists in the Aztec Empire held communal land rights through kinship-based social and territorial units known as *calpulli*. Members of *calpulli* typically farmed family plots that could be inherited, but not bought or sold by individual members. An individual's use of a plot of land was conditional on rendering tribute and personal service, and the authorities of the *calpul* could reassign parcels if the conditions of use were not satisfied (Carrasco, 2000, pp. 180, 193-194). When the Spanish arrived, they initially were less interested in acquiring land than in extracting tribute, leaving the existing economic structure largely intact and even keeping the lower echelons of the Indigenous political hierarchy in place (García, 2000, pp. 243-244, 266). By the mid sixteenth century, the Spanish had imposed their own legal structure on Indigenous communities (*pueblos de indios*), each of which technically became a "civil corporation" controlling a specific territorial jurisdiction and possessing an institutional architecture that was similar to that of medieval Spanish townships (ibid., pp. 253-255, 293).

At least in principle, the Spanish Crown accepted the validity of pre-conquest communal land rights for sedentary Indigenous peoples in Mexico. The *pueblos de indios*, as corporations, were legally in control of their land and allocated parcels to each head of family, which could typically be inherited but not privately sold (Castro, 2010, pp. 90-92). They also possessed common fields, which in Spain were traditionally called *ejidos* because they sat near the exit out of town (Assies, 2008, pp. 35-36). However, despite some degree of continuity with pre-conquest institutions, the Indigenous population was decimated by disease over the course of the sixteenth century. Under these circumstances, European settlers were able, through various legal and illegal channels, to appropriate land left vacant by the precipitous collapse of the Indigenous population (Hausberger, 2010, pp. 70-71; Sellars and Alix-García, 2018). As transoceanic immigration increased, the Spanish began to shift their focus from exacting tribute to acquiring land, leading to conflicts with Indigenous communities (García, 2000, pp. 266-269).

Besides *pueblos de indios*, the other main form of rural landholding in colonial Mexico was the *hacienda*, a large commercial estate that typically produced cash crops or livestock for the market while reserving a portion of its soil for subsistence farming to feed the *hacienda*'s inhabitants.[2] Although *hacienda* workers were often bound to their estates through indebtedness, landowners were initially unable to enforce coercive debt peonage to the extent that would become commonplace by the late nineteenth century (Hausberger, 2010, pp. 71-72). The *hacienda*, as a type of real estate, was legally quite distinct from the tributary arrangement known as the *encomienda* that Spain instituted throughout its American territories shortly after the conquest, but a common thread of paternalism and utilization of Indigenous labor ran through

[2] The simultaneous self-sufficiency and market-orientation of *haciendas* led one historian to conclude that "[t]he *hacienda* is an ideal fruit of a society in which feudalism and commodity economy are indissolubly woven together" (Semo, 1973, p. 258, cited and translated in Bartra, 1993, p. 86).

both institutions. In practice, *hacienda* owners exercised quasi-governmental authority over their primarily Indigenous workers. Furthermore, most *haciendas* had their own Catholic church, consistent with the Spanish tradition of linking labor exploitation with evangelization (Lockhart, 1969, pp. 422-425; Lira and Muro, 2000, pp. 338-341).

By creating an inegalitarian land distribution, though with some nontrivial protections for Indigenous communal property, the Spanish colonial administration set the stage for a series of conflicts over agrarian policy in the nineteenth and twentieth centuries. In brief, the conflicts pitted those who advocated wiping the slate clean and starting over with a U.S.-style uniform private property rights regime against those who argued for strengthening and restoring the ancestral communal property rights of Indigenous villages. The former groups promoted the mid-nineteenth-century liberal reforms and the late-twentieth-century neoliberal reforms, while the latter groups insisted upon land redistribution during and after the Mexican Revolution. Embedded in this rivalry is a tension between strong private property rights, which often favored scheming land speculators skilled at navigating the legal system, versus the rights of Indigenous communities. The fact that this dualism existed at all in Mexico suggests a striking contrast with the United States, where the primacy of private property was never seriously challenged. The following subsections consider each of the three reform movements in chronological order.

The Liberal Land Reform (1856-1911)

After Mexico's independence from Spain in 1821, colonial property institutions remained largely intact. The country's land surface was organized into a patchwork of private, communal, ecclesiastical, and governmental property. Much of the land had been granted by the Spanish Crown to civil and ecclesiastical "corporations", including townships, religious orders, parishes, parishioners' associations, and Indigenous communities. The individuals who farmed land

belonging to corporations were prohibited from selling it. However, the Liberal Party was intent on providing titles to the existing tenants, thereby transforming corporate property into private property that could be freely bought and sold. Toward that end, the "Lerdo Law" of 1856, named after Treasury Minister Miguel Lerdo de Tejada, required that most of the real estate belonging to civil and ecclesiastical corporations be converted into private property, a process known as disentailment (Marino and Zuleta, 2010, pp. 439-440).[3] The principle of disentailment was subsequently incorporated into the Constitution of 1857, which was distinguished by its strong protections on private property rights (Marino, 2016, pp. 287, 291).

The main objective of disentailment was to undermine the power of the Church (Kourí, 2002, p. 83-84). However, liberal leaders also hoped that privatizing communal property would breathe fresh life into moribund real estate markets by providing secure property titles to those who had previously enjoyed only limited property rights. They contended that corporatist restrictions on property rights, such as the right to freely buy and sell land, were a relic of religious paternalism, an impediment to individual freedom, and an obstacle to progress (Herrera, 2012, pp. 636-637; Purnell, 1999, p. 89). Liberals also argued that the privatization of communal property would increase the size of the property tax base (Escobar, 2012, pp. 3-4). Moreover, voting rights had historically been linked to property ownership, so privatization was related to discourse regarding the responsibilities of citizenship (ibid., p. 13). The long-range vision was to fulfill the aspiration of the early Liberal Party leader José María Luis Mora to "create a multitude of small proprietors who by their expansive force would be the base of public

[3] Disentailment laws had already been passed by some states prior to 1856 (Kourí, 2017, p. 1936).

order" (quoted in Hale, 1968, p. 178).[4] Somewhat ironically, this noble-sounding goal was to be achieved by dissolving Indigenous communities as legal entities (Muñoz, 2015, pp. 23, 30).

The first lands to be privatized were those well suited for producing cash crops and those located along major transportation routes (Escobar, 2012, p. 22). Although various regulations were conceived to prevent land speculators from taking advantage of privatization, the implementation process was often chaotic (Schenk, 1995, pp. 16-22, 29). The division of communal lands and the assignment of property rights to individuals was inevitably contentious and marred by disputes over property lines and village boundaries (ibid., pp. 21-28). Moreover, there were many instances of irregularities or outright fraud in the process of issuing land titles to Indigenous community members. Individuals without communal land rights might be improperly added to the community census and others who did possess land rights were excluded. Community members who promised to sell their land to outsiders often received the largest or highest-quality tracts and illegal usurpation of community lands by private landowners was sometimes formalized via the privatization process (Purnell, 1999, pp. 90, 94-98).

Many Indigenous communities resisted the privatization of communal property through a variety of delay tactics, formal petitions, and legal challenges (Schenk, 1995, pp. 23-27; Purnell, 1999, p. 87). The slow pace of privatization, in turn, led some state authorities to further incentivize compliance by levying onerous taxes on communal property, then confiscating land for nonpayment of taxes and auctioning it off to private landowners. The privatization policies became increasingly coercive in the late nineteenth century as new state laws deprived Indigenous communities of their few remaining legal recourses for resisting the breakup of

[4] Contemporary policymakers seconded this view. A cabinet minister said that the Lerdo Law would cause "a true revolution, converting the propertyless into property owners overnight…" (quoted in Muñoz, 2015, p. 20). Lerdo himself, in a letter to the governor of Michoacán, said that the law "instead of harming Indians, helps them by converting them into property owners" (quoted in Marino, 2016, p. 291).

communal lands (ibid., p. 92). In 1882, the Supreme Court of Mexico ruled that Indigenous communities could not defend themselves in court because the Lerdo Law had abolished the legal basis for their existence (Marino, 2016, p. 295). In spite of the law, however, those communities continued to exist and manage their land as they had always done (ibid., p. 300). In some places, Indigenous communities responded to the intransigent application of liberal dogma in agrarian matters by engaging in open rebellion (Powell, 1972, pp. 661-672).

Ejidos (commons), which had originally been exempted from partition, were increasingly divided up as private property (Knowlton, 1998, pp. 79-92).[5] Further contributing to the decline of communal landholdings were federal laws passed in 1883 and 1894 that facilitated the private acquisition of "vacant" land (Marino and Zuleta, 2010, p. 441). Because many communities lacked formal deeds to their land, their commons and other property were often claimed by outsiders or auctioned off (Assies, 2008, pp. 38-39). Even when documentation of ownership existed, it was often invalidated by the courts. While figurative painted maps and primordial titles written in Indigenous languages were sometimes admitted as valid evidence in colonial land disputes (Pulido, 2012; McDonough, 2021, pp. 243-245), there was also a long tradition of challenging the credibility of such documents (Greer, 2018, p. 140). The frequent ambiguity or absence of *ejido* titles facilitated the government's colonization program, whereby public lands were made available to foreign settlers. This practice, combined with the involvement of foreign companies in surveying and acquiring "vacant" lands, probably contributed to the nationalistic character of the Mexican Revolution (Tannenbaum, 1950, pp. 138-141).

[5] There were four categories of communal village land. Cultivated family parcels were called *terrenos de común repartimiento*. The *ejidos* were used for forage, firewood collection, and timber harvesting. The third category of land was "*propios*", lands that were typically rented out as a source of public revenue. Finally, the *fundo legal* was the land that the town itself was built on (Schenk, 1995, p. 11).

The various legal and illegal means by which communal land was alienated primarily benefitted the owners of neighboring *haciendas*, which monopolized local land markets in most regions of Mexico. Even when privatization did initially benefit the tenants it was designed to help, *hacienda* owners were frequently able to acquire additional land from smallholders when the latter failed to pay property taxes or defaulted on collateralized loans (González, 2000, p. 649). By the myriad channels described above, a relatively small number of private landowners amassed vast estates. Many *haciendas* now operated as capitalist agricultural enterprises while maintaining semi-feudal characteristics inherited from the colonial period, such as the landlord's quasi-judicial power to punish residents for offenses. The same process forced peasants formerly under the tutelage of civil and religious corporations into oppressive debt peonage on *haciendas*. They were often paid in vouchers that could only be redeemed at the estate's company store (*tienda de raya*), which contributed to the prevalence of debt servitude. In addition, and unlike more traditional *haciendas*, workers were typically subjected to rigid labor discipline and long work hours (ibid., pp. 681-683).

By 1910, nearly 82% of rural communities lay within the boundaries of *haciendas* (Tannenbaum, 1950, p. 141).[6] The proportion of the rural population living on *haciendas* was somewhat smaller, about 47%, with another 51% living in free agricultural villages (Sanderson, 1984, pp. 17-18). The disproportionately large amount of surface area controlled by *haciendas* meant peasants living in free villages were often confined to very small agricultural plots. Other village residents depended on the *haciendas* for paid work (Knight, 1986, p. 97). While precise

[6] The same figure is cited in numerous later studies, including Sanderson (1984, p. 18), Knight (1986, p. 96), and Herrera (2012, p. 638). Although statistics on *hacienda* property for earlier periods are even less reliable, one estimate puts the share of land in the hands of *haciendas* and *ranchos* circa 1810, near the end of the colonial period, at 36% (Bartra, 1993, p. 88). If true, this would suggest a large increase in *hacienda* landownership and, implicitly, an increase in land concentration, from 1810 to 1910.

statistical data are elusive, Mexico's Secretariat of Agrarian Reform estimated that, on the eve of the Mexican Revolution, only 4.2% of Mexico's rural population had managed to maintain usufruct rights to communal property, another 3.0% were small proprietors, 1.5% were medium- and large-landholders, and the remaining 91.3% were landless, with most of the latter group working either as sharecroppers or indentured laborers. Moreover, only 0.2% of the rural population owned 87% of the land (Assies, 2008, p. 39). Another estimate, based on census data, suggests that perhaps only 2.4 percent of rural household heads in Mexico owned any land by 1910 (Engerman and Sokoloff, 2002, pp. 68-70).

The statistics cited above indicate that, although many villagers had received individual titles to former communal lands, large numbers of them apparently sold or otherwise lost possession of their land, which in many cases was incorporated into large estates. The loss of communal lands not only worsened inequality between *hacienda* owners and the rest of the rural population, but also disrupted community life in numerous other ways. For example, privatization of community lands eliminated rental revenues that had funded the provision of local public goods and blocked access to the commons that had been used for firewood collection and pasturage, making it harder for the remaining villagers to earn a livelihood (Powell, 1972, pp. 659-660). While Liberal Party leaders had hoped for a different outcome when they initially embarked upon the breakup of civil and ecclesiastical corporations, they had long recognized that strong protections on private property rights required toleration of large estates (Hale, 1968, p. 225). In a tragic irony, the Liberal Party's effort to remake Mexico into a nation of yeoman farmers resulted in mass dispossession and extreme inequality.

The Revolutionary Land Reform (1915-1992)

Agrarian discontent was among the chief causes of the 1910-1920 Mexican Revolution (Knight, 1986, pp. 78-79). Recognizing that rural inequality was fueling civil unrest, President Porfirio Díaz recommended land reforms to Congress in early 1911. That proposal came too late to save his presidency, but by January 1915 the revolutionary government of Venustiano Carranza issued an agrarian reform law in response to the demands of dispossessed peasant communities (Marino and Zuleta, 2010, p. 442). The revolutionary leader most closely associated with land redistribution was Emiliano Zapata, whose main base of support consisted of communal villages in eastern central Mexico that had lost land to *haciendas*. The Zapatista agrarian reform project, which was implemented in parts of central Mexico, was generally more radical than Carranza's decree. One key element of the Zapatista program, which would subsequently be integrated into national agrarian law, defined village lands as inalienable (Sanderson, 1984, pp. 27-28). Prohibitions on the sale of community land reflected the lessons learned from the dispossession of small landholders in the aftermath of the liberal reforms.

The major revolutionary agrarian reform proposals envisioned two key tools of redistribution: restitution of ancestral village lands and, when that was not feasible, outright land grants or "*dotación*" (Baitenmann, 2011, p. 6). For practical reasons, communities that lacked strong proof of title to their lands often opted to seek land grants, rather than restitution (ibid., pp. 7-8). Petitions for land grants were ultimately much more likely to be approved than requests for restitution due to the difficulty of proving legal rights to land that had been usurped during the nineteenth century (Sanderson, 1984, p. 88).[7] Both mechanisms of redistribution, restitution

[7] Bobrow-Strain (2004, p. 895) provides an example from a later period of the San Sebastián de Bachajón *ejido*'s attempt to prove title to lands usurped by neighboring landowners in the 19th century. In 1983, the *ejidatarios* were able to recover 200-year-old documents from the Archive of Central America in Guatemala which, they claimed,

and land grants, were ultimately incorporated into Article 27 of Mexico's 1917 Constitution, signaling the revolutionary government's long-term commitment to agrarian reform.[8] Article 27 provided a framework for breaking up large estates and creating, in their place, of a new type of communal property known as *ejidos*.[9] *Ejidos*, together with agrarian communities, today comprise the "social property sector" in Mexico, as distinct from the private property sector (Assies, 2008, p. 33; Bouquet, 2009, p. 1392). Agrarian communities are typically of Indigenous heritage and their communal property is subject to slightly different rules, although they are similar to *ejidos* in most respects (de Ita, 2006, p. 149; Assies, 2008, p. 48; Bartra, 1993, p. 84).

Article 27 created the constitutional basis for a mass transfer of land from the private sector, mainly *haciendas*, to the social sector, mainly *ejidos*. The former owners of confiscated lands were to be compensated at tax value using 5% 20-year bonds (Assies, 2008, p. 40). New rules introduced in 1922 set maximum size limits for private farms to be exempted from potential expropriation (Sanderson, 1984, p. 46). After peasants had formally requested land redistribution, their petitions were subjected to a rigorous review process involving local, state, and federal officials before a definitive approval or disapproval was issued (ibid., pp. 52-54).

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demonstrated "primordial title" to the disputed land. In 1990, the government determined that the documents were genuine but were insufficient to prove dispossession.

[8] The 1934 version of section 10 of article 27 of the 1917 Constitution reads, in part: "Population centers that lack commons [*ejidos*] or that cannot achieve their restitution due to lack of titles, impossibility of identifying them, or because they have been legally alienated, will be granted lots, lands, and water…." Section 12 reads, in part, "Requests for restitution or land grants for lands or waters will be presented in the States and Territories directly before the Governors." (Estados Unidos Mexicanos, 1934).

[9] The term "*ejido*" had originally referred to just one among several components of village landholdings, often translated into English as the "commons" (see Knowlton, 1998, pp. 72-75, for an examination of various meanings of the word). By the end of the Mexican Revolution, however, the term came to represent the entirety of the village's communal property. The modern meaning of "*ejido*" is thus not directly comparable with earlier meanings (Baitenmann, 2011, pp. 5-6). Bartra (1993, pp. 94-95) claims that *ejidos* are not strictly communal property, but rather "a form that intermingles various types of property: state or nationalized, corporate, communal, and private", but he acknowledges that "the beneficial use of the ejido is subject to a large number of restrictions and limitations that attempt to reproduce the traits of communal property." In the context of a case study of peasant communities in the state of Hidalgo, Bartra (1993, p. 180) again compares communal to *ejido* property.

Only Mexican citizens by birth engaged full-time in agriculture were eligible to receive land (ibid., p. 44).[10] Other eligibility requirements included limits on personal wealth and residency in the village applying for land for at least six months prior to the application (de Vany and Sánchez, 1977, pp. 742-743). These stringent requirements helped ensure that land was redistributed to the target population of peasant farmers.

Beneficiaries of land reform were required to work the land themselves and would lose their usufruct rights if they left the land idle for more than two consecutive years (Sanderson, 1984, p. 54). *Ejido* plots could be inherited, but could not be rented, sharecropped, sold, or used as loan collateral (Brown, 1997, p. 103; de Janvry et al., 2015, p. 3130).[11] The prohibition on land sales by individual farmers and the requirement that community members personally farm their allotted parcel except for absences of a few years were characteristics of communal land rights in both the pre-conquest period (Carrasco, 2000, pp. 180, 193-194) and the colonial period (Assies, 2008, p. 36). Although the present legal form of the *ejido* was created in the twentieth century, many of its peculiar features were already familiar to Mexican peasants.[12] Prohibitions on mortgaging or alienating village lands were designed to prevent a repetition of the land loss and rising inequality that characterized the 1856-1911 period (Fernández y Fernández, 1957, pp. 155-156; Stavenhagen, 1975, p. 148). Because private banks were reluctant to lend to farmers who could not use their land as collateral, the government in 1936 created a bank to provide credit to *ejido* members (Sanderson, 1984, p. 110-111).

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[10] Other parts of Article 27 limited foreign ownership of land in general (Vázquez, 2001, p. 46).

[11] The law specified that *ejido* plots could only be inherited by one heir, although this principle was not always followed in practice, leading to land fractionation (Nuitjen, 2003, p. 487; Muñoz-Piña, de Janvry, and Sadoulet, 2003, p. 131).

[12] Thompson and Wilson (1994) argue that "the *calpulli*, a common property regime, has persisted in one form or another from before the Spanish Conquest throughout Mexico's history to the present as a tenure regime for managing marginal lands" (p. 449).

Although created by the authority of the state, *ejidos* are locally controlled by a general assembly composed of all *ejido* members (called *ejidatarios*) along with representative bodies called the *ejidal* commissariat and the supervision council. Before 1992, these bodies were responsible for allocating permanent, heritable usufruct rights over *ejido* parcels to individuals, who were not allowed to possess more than one plot (Nuitjen, 2003, pp. 477-478). Each *ejido* held a collective property title to its lands and individual *ejidatarios* were supposed to receive membership certificates which did not designate the location of their plots (Bouquet, 2009, p. 1392).[13] In addition to individual parcels, most *ejidos* also have commons (*tierras de uso común*), which typically consist of uncultivated land used for activities such as livestock grazing and forestry (ibid.).[14] The commons account for well over half of all *ejido* lands and are collectively managed through the *ejido*'s governance institutions (Thompson and Wilson, 1994, p. 449). The division of communal property between family plots and commons is reminiscent of colonial and pre-conquest land tenure conventions (Herrera, 2012, p. 635).

Most evidence suggests that Mexico's redistributive agrarian policies emerged as a response to mass mobilization by peasant communities that had suffered dispossession in the years leading up to 1910 (Sanderson, 1984, pp. 27, 72, 79). Areas of central Mexico that witnessed strong peasant insurgencies during the revolution were host to some of the first attempts to implement land redistribution. For example, by 1920, 39% of the land in Morelos, Emiliano Zapata's home state, had already been redistributed (Marino and Zuleta, 2010, p, 451). In general, however, the conservative faction of revolutionaries that defeated Zapata was

[13] Some *ejido* residents are *avecindados*, i.e. those who acquire land, but do not thereby become *ejido* members and cannot vote in *ejido* assemblies. Some *avecindados* arrive in the village after the initial creation of the *ejido*, while others may be children of *ejidatarios* (since normally only one child can inherit a parcel). *Ejidos* sometimes convert *avecindados* into *ejidatarios* (Vázquez, 2001, pp. 97, 249, 302; Smith et al., 2009, p. 186).

[14] Occasionally, a portion of the commons are reserved to be distributed as parcels to new ejidatarios (de Ita, 2006, p. 157).

reluctant to implement large-scale, nationwide land reform (Sanderson, 1984, pp. 56-60). Not until the presidency of Lázaro Cárdenas (1934-1940) did the government vigorously pursue the redistribution of high-quality lands (ibid., pp. 72, 95-96). After 1934, resident workers on *haciendas* were allowed to solicit land, contributing to the breakup of large estates (ibid., p. 44). By the end of the Cárdenas administration, perhaps 60% of Mexico's agricultural population had benefitted from agrarian reform (ibid., p. 128) and 47.4% of the country's arable land had been incorporated into the social property sector (Assies, 2008, p. 43).

After 1940, land redistribution again receded in importance, although it intermittently resurfaced as a national priority, especially during the 1960s and '70s (Sanderson, 1984, pp. 58-60, 65-66, 103-104). As a result of the various waves of land reform, the share of Mexico's total land area held as private property fell from around 93% in 1930 to about 50% by 1970 (Yúñez, 2010, p. 736).[15] During the 1950s and '60s agricultural productivity in Mexico increased rapidly (ibid., pp. 737-738).[16] By 1965, Mexico had achieved substantially higher agricultural productivity than most major Latin American countries (Bartra, 1993, p. 31). Although many elements interacted to generate strong productivity growth, land redistribution was arguably a contributing factor (Sanderson, 1984, pp. 57, 140; Dunn, 2000, p. 218). However, from 1966 to 1979, growth in the production of maize stagnated, partly as a result of lower output prices. Starting in the 1970s, Mexico lost its position as a net exporter of maize, which was historically

[15] As a percentage of total land area, *ejido* property edged upward from 22.5% in 1940 to 26.3% in 1960, before jumping to 44.8% by 1970. However, as a percentage of arable land area, the increase was less pronounced, from 47.4% in 1940 to 55.1% in 1970. While 1930 *ejido* statistics are not directly comparable with those figures because they only applied to tracts of more than 1 hectare, they reflect the fact that *ejidos* were a small fraction of both total area (7.5%) and cultivated area (13.4%) before the Cárdenas presidency (Bartra, 1993, p. 97). Although rural land inequality was greatly reduced from 1930 to 1970, it was not eliminated. According to one estimate, by the 1970s, 2% of agricultural producers controlled 21% of arable land (Assies, 2008, p. 47).

[16] Furthermore, from 1940 to 1970, the percentage of *ejido* production sold on the market also increased from 54% to 86%. The overall percentages, including private property owners, are very similar (Bartra, 1993, p. 152).

the nation's main staple crop, and became a net importer (Yúñez, 2010, pp. 734, 739-740). Mexican agriculture suffered additional setbacks in the 1980s as a consequence of a national economic crisis sometimes known as the "lost decade" (ibid., p. 742). The problems afflicting agriculture would pave the way for neoliberal reforms of the *ejido* sector in 1992.

Over the course of the twentieth century Mexico industrialized and urbanized. Between 1910 and 1990, the rural share of the country's total population fell from 71.3% to 28.7% (Vázquez, 2001, p. 92). Over the same period, *ejidos* became the dominant landowning institution in rural Mexico. By 1991, there were over 3.5 million members of *ejidos* or agrarian communities. Making some assumptions about average family sizes, Thompson and Wilson (1994, p. 449) estimate that perhaps as many as 18 million people, or 21% of Mexico's total population belonged to *ejido* households.[17] Around 52% of Mexico's total land area had been incorporated into the social property sector, including 56% of the country's agricultural land and 70% of its forests (de Ita, 2006, p. 149). Land redistribution also contributed to a reduction in the concentration of non-*ejido* land and increased the number of small private property owners (Bartra, 1993, pp. 91-94). Whereas the 1857 Constitution had failed to remake rural Mexico into Mora's "multitude of small proprietors," the 1917 Constitution was more successful, despite (or perhaps because of) its preference for communal property over private property.

While land reform may have engendered social stability and short-run productivity improvements, Albertus et al. (2016, pp. 163-165) argue that it ultimately suppressed long-run economic growth. One study, using data from the state of Chiapas, found that private farms are actually more productive than *ejidos*, on average. However, the study also determined that the difference is entirely due to the fact that private farms tend to be larger and thus benefit from

[17] Another research estimated that residents of *ejidos* and agrarian communities made up 25% of Mexico's total population circa 1992 (Vázquez, 2001, p. 123).

economies of scale (Dunn, 2000, p. 224). In general, *ejidos* were no less productive than comparably sized private farms (Heath, 1992, pp. 702-705). These results suggest that a small scale of production, rather than the inherent traits of communal property, can explain the observed productivity differentials. The inefficiently small scale of *ejido* production was a perennial source of concern to government officials. During the 1930s and, to a lesser extent, the 1970s, the central government attempted to remedy this problem by forming collective or cooperative *ejidos* that could take advantage of economies of scale. However, Mexico's experiment with collective agriculture was short-lived as a result of internal conflicts and the vagaries of national politics. The land of most collectives was eventually divided into individual parcels, while remaining part of the social property sector (Stavenhagen, 1975, pp. 151-163).

A variety of other critiques were levied against the agrarian reform project throughout the twentieth century. On the one hand, some private property owners had always felt that *ejidos* were an attempt to subvert the free enterprise system or to impose semi-feudal restrictions on individual progress (Stavenhagen, 1975, pp. 147-148). However, misgivings arose even among those who counted the insulation of *ejidos* from free markets and land speculators as one of their chief virtues. Some of the perceived shortcomings of *ejidos* included limited autonomy, excessively rigid rules governing usufruct rights, over-reliance on subsidized credit and other government supports, a lack of incentives to invest in improving land (because it could not be sold), and lack of sales revenue for those who abandoned their land to work elsewhere, which limited peasant mobility (Fernández y Fernández, 1957, pp. 154-156). One economic study argued that prohibitions on the sale or rental of *ejido* land may have increased fertility rates by providing incentives to overinvest in children and underinvest in land (de Vany and Sánchez,

1977, p. 761). Government officials also sometimes claimed that there was simply no more land left to redistribute (Sanderson, 1984, pp. 84, 148).

Others attacked *ejidos* from the left, arguing that peasant agriculture was subordinated to the capitalist sector of the national economy in a relationship of unequal exchange. From that perspective, *ejido* producers suppressed their farm output prices down to subsistence levels in a form of "self-exploitation" to stay competitive in urban markets (Bartra, 1993, pp. 9-20, 64-66).[18] Indeed, starting in the 1940s, Mexico's government shifted its focus toward achieving rapid industrialization and prioritized reducing the rate of growth in the urban cost of living by ensuring low food prices (Sanderson, 1984, p. 121). In addition to unequal exchange with urban capitalists, *ejidos* were also, in some cases, subordinated to capitalist farmers through informal leasing arrangements.[19] Renting *ejido* land was initially illegal except under rare circumstances involving minors, widowhood, physical incapacity, and the like, but reforms enacted in 1971 added broader and more vaguely defined conditions under which *ejido* land could be rented (Bartra, 1993, p. 197). Even before that, however, *ejido* land was sometimes illegally leased out under an arrangement in which the *ejidatarios* were paid by the leaseholder to work their own land (ibid., p. 102). In retrospect, such practices represented early inroads of capitalist agriculture into the social property sector, paving the way for an epochal policy reversal in 1992.

[18] Bartra associates *ejidos* with a non-capitalist simple commodity mode of production that is articulated with the capitalist mode of production dominant in Mexico (Bartra, 1993, pp. 10-11, 97), but he also suggests that the roughly 3 million day laborers living in the countryside represent a rural proletariat (ibid., p. 125).

[19] Numerous studies report instances of illegal rental or sale of *ejido* land prior to the 1992 reforms which made such transactions legal (Herrera, 2012, p. 634; Perramond, 2008, pp. 367-368; Sanderson, 1984, p. 107; Stavenhagen, 1975, p. 148; Bouquet, 2009, p. 1393-1394). Thompson and Wilson (1994, p. 459) note: "Even some U.S.-based producers of vegetables rented land illegally."

The Neoliberal Land Reform (1992 – Present)

In 1992, Article 27 of the 1917 Constitution was amended to eliminate the clauses authorizing redistribution, certify the land rights of existing *ejidatarios*, and allow them to legally rent and sell *ejido* land (Yúñez, 2010, p. 743).[20] The reform did not remove limits on land rental or sales for Indigenous agrarian communities, although the latter could effectively eliminate those limits after first becoming *ejidos* (Perramond, 2008, p. 365; de Ita, 2006, p. 155).[21] The 1992 reforms also established an Agrarian Attorney's Office and Agrarian Tribunals to litigate land disputes and a National Agrarian Registry to store information on *ejido* parcels (Appendini, 2020, p. 92). They made it easier to form joint ventures with private investors and permitted foreign direct investment in the *ejido* sector (Cornelius and Myhre, 1998, p. 4).[22] *Ejidatarios* were allowed to hire wage labor and were no longer required to personally work their land in order to maintain usage rights, meaning that they could become absentee landlords without running the risk of losing their land (Appendini, 2020, p. 84). Furthermore, they could lease their parcels for up to 30 years, renewable, and they could offer *ejido* land as loan collateral with the proviso that only usufruct rights, and not the full title, could be transferred to the lender in the event of a default (Foley, 1995, p. 66).

The government argued that the 1992 reform would increase tenure security by formalizing transactions such as rental of *ejido* land that were already occurring illegally

[20] The reforms also formalized the roles of *avecindados* and *posesionarios*, who hold ejido land but are not *ejido* members (Appendini, 2020, p. 85).

[21] An agrarian community seeking privatization would first have to vote to become an *ejido* and would then vote to privatize its land before the land could be sold (De la Vega-Rivera and Merino-Pérez, 2021, p. 9). Interestingly, the prevalence of Indigenous communities, rather than *ejidos*, in the state of Oaxaca is one reason for that state's very low rate of land certification under the 1992 reforms (de Ita, 2006, p. 155).

[22] The 1981 Agricultural Development Law in principle allowed partnerships between *ejidatarios* and private investors but, by 1988, there were only 23 formally registered joint ventures (Heath, 1992, p. 698).

(Bouquet, 2009, p. 1392). The main goals of the reform included increasing private investment in agriculture, reducing state subsidies, and allowing the sale of *ejido* property so that free markets could allocate land to the most efficient producers (ibid., p. 1390; Vázquez, 2001, p. 141). The goals of formalizing land markets and certifying property rights to promote investment and efficiency were grounded in the principles of the New Institutional Economics (Appendini, 2020, pp. 74-78). Those principles were in vogue at major multilateral institutions at the time. In 1990, the World Bank issued a policy document arguing for stronger protections on individual property rights in the *ejido* sector (de Ita, 2006, p. 150). The reforms to Article 27 were just one dimension of a larger process of privatization and legal reform promoted by multilateral institutions in the aftermath of Mexico's sovereign default in 1982 (Vázquez, 2001, pp. 130-156). Thus, de Ita (2006, p. 148) quips that "agrarian reform in twentieth-century Mexico began with the revolution of 1910 and ended with the World Bank."

The timing of the constitutional reform, two years prior to the implementation of the North American Free Trade Agreement, was not coincidental (Foley, 1995, p. 63; Perramond, 2008, p. 359). Mexican officials were seeking to integrate Mexico into the global economy and modernize the country's agricultural sector (Vázquez, 2001, p. 57). In this context, ending the expropriation and redistribution of rural land was seen as a necessary step toward cultivating a favorable investment climate (Foley, 1995, pp. 65, 71-72; Torres-Mazuera, 2020, p. 31). As stated by Undersecretary of Agriculture Luis Téllez in 1991: "There is a need for well-defined property rights, enforceable through the judicial system. The lack of such security has hindered agricultural investment in Mexico" (quoted in Cornelius and Myhre, 1998, p. 5). Around the same time as the evisceration of Article 27, other neoliberal reforms reduced tariffs and eliminated import licenses for agricultural goods, removed price supports, slashed agricultural

subsidies, dismantled agricultural extension services, and restricted logistical and other services to *ejidos* (Yúñez, 2010, pp. 743-744). Crop insurance and development bank credit to *ejidos* were also curtailed (Assies, 2008, p. 50; Lewis, 2002, p. 404).[23] All of these policies were part of a broader economic liberalization process that began in the 1980s.

To implement the land titling provisions of the 1992 reforms, the Mexican government created Procede (program for the certification of *ejido* land rights and the titling of urban house plots).[24] *Ejidatarios* were to receive certificates stating their name and the size and boundaries of their parcels (Smith et al., 2009, p. 182). Although the certificates are legally valid and are often called property titles, they were issued by the agrarian reform agency rather than local private property registries (Bouquet, 2009, p. 1394). Each local *ejido* assembly had to approve certification before the process could begin in its jurisdiction, and some refused to do so.[25] The certification process took 13 years to complete (1993-2006) and, even at its end, the process was incomplete in about 8% of *ejidos* and agrarian communities (Appendini, 2020, p. 93). Because Procede enabled taxation of *ejidatarios'* housing lots, some feared losing their homes for nonpayment of property taxes (Vázquez, 2001, p. 262-263).[26] Certification proceeded most rapidly in regions with concentrations of agro-industrial firms and increasing suburbanization, particularly in northern Mexico (Perramond, 2008, pp. 362, 364).

[23] The amendments to Article 27 simultaneously also allowed corporations to own land and permitted foreign corporations and individuals to own land in the interior of the country (Thompson and Wilson, 1994, p. 448).

[24] A very similar program, Procecom, was established to provide certificates in agrarian communities (Smith et al., 2009, p. 182; Torres-Mazuera, 2020, p. 44).

[25] In addition, Procede would not survey or certify *ejido* land boundaries that were in dispute (Nuitjen, 2003, p. 491; Vázquez, 2001, p. 262; Smith et al., 2009, p. 181).

[26] Zendejas and Mummert (1998, p. 195) report that an *ejido* they studied rejected titling of housing lots due to fears of taxation. *Ejido* agricultural parcels remained nontaxable (Velázquez, 2020, p. 168).

Many *ejidos* used Procede as an opportunity to grant titles to community members whose land rights had previously been unrecognized. In some cases, this process helped formalize the rights of peasant farmers who had long belonged to the same communities, and were often family member of *ejidatarios*, but who had never been granted a vote in the *ejido*'s general assembly (Velázquez, 2020, pp.166, 170). In other cases, however, it inappropriately added external businesspeople to the *ejido*'s rolls in a manner reminiscent of nineteenth-century land fraud schemes (Torres-Mazuera, 2020, pp. 45-46). In some communities, Procede provided an opportunity for land-poor *ejido* members to enlarge their individual parcels by dividing up the commons. The latter process may have helped reduce land concentration within *ejidos* at the expense of common property resources (Muñoz-Piña, de Janvry, and Sadoulet, 2003, p. 156). On the other hand, the 1992 reforms also introduced new practices and rules that would appear to favor increased land concentration within *ejidos*, for example by allowing a single *ejidatario* to acquire multiple plots of *ejido* land (Nuitjen, 2003, p. 480). In some *ejidos*, titling excluded certain groups that had formerly been allowed to use the land (Velázquez, 2020, p. 168). The net effect of Procede on land inequality within *ejidos* is therefore not obvious.

For some land uses, such as grazing, individual land titling may be less pragmatic. In semi-arid pastureland, many *ejidatarios* would prefer to graze their livestock over the whole commons, instead of keeping only a small tract (Perramond, 2008, pp. 362-363). In dry environments, access to large rangelands is a useful strategy for coping with spatial variability in rainfall and vegetation quality. In that sense, the commons can represent a spatially diversified portfolio in rangeland, which can help mitigate the risk that localized environmental misfortunes will ruin small ranchers' livelihoods (Thompson and Wilson, 1994, pp. 454-461). However, despite the disadvantages of grazing cattle on small parcels (and the high cost of fencing those

parcels), a case study of a Sonoran *ejido* suggests that many livestock-owning *ejidatarios* were eager to claim parts of the common pastureland as individual property. Yet, another faction within the same community strongly opposed individual land titling and worried that it would lead to a selloff of pastureland to wealthy outsiders (Yetman and Búrquez, 1998, pp. 80-89).

Perhaps the most important changes in national agrarian law resulting from the 1992 constitutional reforms were provisions that allowed *ejidatarios* to rent, sharecrop, mortgage, or sell their land. While it was straightforward to rent out or sharecrop land, or to sell it to other *ejido* members, land could only be sold to external individuals or corporations after converting it to freehold status (*dominio pleno*), which is synonymous with privatization.[27] Privatizing *ejido* land and selling it to outsiders requires a two-thirds vote of the general assembly with a legal quorum present and it can only be done after certification is completed (Smith et al., 2009, p. 186; Assies, 2008, pp. 51-52; de Ita, 2006, p. 151). Either individual *ejidatarios* or whole *ejidos* can convert their land into freehold property, by vote of the general assembly, after which it can be legally sold to outsiders (Lewis, 2002, p. 405).[28] While the 1992 reforms established a mechanism for converting social property into private property, privatization was not automatic. Land certification under Procede was only the first step in the process and many *ejidos* never went beyond that step. In most places, the certification process merely formalized the *status quo* in which *ejidatarios* maintained *de facto* control over their parcels while retaining collectively managed commons (Perramond, 2008, pp. 359, 366, 369).

[27] The view that privatization was the ultimate purpose of the reforms to Article 27 was widespread (e.g. Cornelius and Myhre, 1998, p. 1, state that the goal was "to permit and even to encourage – but not to compel – the privatization of previously inalienable, communally held *ejido* land"). One *ejidatario* told an interviewer that the reforms were part of "a government plot to make the *ejido* sector disappear" (Lewis, 2002, p. 414).

[28] Some restrictions applied to *ejido* property sold to outsiders. Subdivision of plots was disallowed and the spouse and children of the seller were given priority over outsiders should they decide to buy the plot themselves (Bouquet, 2009, pp. 1394-1395).

Interestingly, in a study for the state of Tlaxcala from 1993 to 1998, around 30% to 40% of land sales were not formally registered with the authorities, although they typically involved some type of written contract and exchange of title (Bouquet, 2009, p. 1395). This is puzzling because a major rationale for the titling reform was to eliminate such informality in land transactions. The main conclusion of that study is that, while the land certification program was generally well run, the formation of a legal market for sales of *ejido* land was marred by top-down decision-making and inadequate follow-up, which may have increased tenure insecurity in some cases (ibid., p. 1397). A case study of an *ejido* in the state of Veracruz documented the proliferation of informal land sales after certification, although most sales were to other community members rather than to outsiders. Even though the land had not been converted into freehold property, many *ejidatarios* treated their Procede certificates as if they were private property titles and sold land without informing the *ejido* assembly (Hausermann, 2014, pp. 790-791). Despite the increase in intra-*ejido* land sales, land certification did not cause noticeable changes in credit access, investment, or land use in this particular locale (ibid., p. 796).[29]

Many *ejidatarios* have entered into contracts with national or international firms to sell their produce. Interviews conducted in the vicinity of Pénjamo, Guanajuato, suggested that contract agriculture is sometimes appealing due to offering stable and predictable prices for farm output (Perramond, 2008, p. 363). Even by the early 1990s, some *ejidatarios* had already entered into contracts with large multinationals such as Gamesa (owned by Pepsi), Domecq, and Tropicana (Thompson and Wilson, 1994, p. 460). In addition to contract farming, land rental became increasingly widespread after 1992. In a case study of four *ejidos* in the Yaqui Valley of

[29] In a case study for an *ejido* in Jalisco, Nuitjen (2003) finds similar results, i.e. that the 1992 reforms increased informal land sales without achieving greater agricultural productivity. The informality of land sales gave rise to a new type of tenure insecurity, as some sellers later regretted their decision and sought to recover the land, using to their advantage the fact that the original sales were not properly registered (Léonard, 2020, pp. 218-228).

Sonora, 70 percent of *ejidatarios* interviewed were renting out their land by 1999, in most cases to private farmers (Lewis, 2002, pp. 407-408). The reforms to Article 27, combined with a contraction of subsidized credit and other supports, compelled many *ejidatarios* to rely on rental income plus off-farm work (ibid., pp. 409-416). A case study conducted in the state of Campeche suggests that many *ejidatarios* informally rented out their land either because they were elderly and were no longer able to work the land themselves or because they were working in non-agricultural jobs (Torres-Mazuera et al., 2020, pp. 132-133, 138). These studies suggest that contract agriculture and land rental markets had mixed effects on poverty and inequality.

In general, land rental markets are not perceived as threats to the territorial integrity of *ejidos*, whereas land sales markets are of much greater concern.[30] The sale of *ejido* land is sometimes associated with the dispossession that *ejidos* were originally designed to combat. Bouquet (2009, p. 1394) quotes *ejidatarios* as saying, in reference to the pre-1992 situation, "it is a good thing that land sales were forbidden, because if not it would have been too easy for the *latifundista* to get the land back again" and "*ejido* land should not be sold because our fathers fought for it; land should not be sold because we must pass it on to our children."[31] A survey in the state of Puebla indicated that many *ejidatarios* associate the sale of land with failure (Otero, 1998, p. 101).[32] Interestingly, government authorities appeared to be aware of such sentiments and, when they ran television advertisements in 1998 to build trust in Procede, the adds featured

[30] Bouquet (2009, p. 1393) notes that, unlike the land sales market, the land rental market raised few tenure security concerns among either *ejidatarios* or government institutions. In the same vein, Almanza et al. (2020, p. 356) report that Indigenous *ejidatarios* interviewed in Chihuahua objected in principle to the sale of *ejido* land but expressed no concern over the rental or sharecropping of *ejido* land.

[31] Along the same lines, Vázquez (2001, p. 252) reports that, during fieldwork in one *ejido*, a resident posed the rhetorical question: "land privatization and land deprivation is the same thing, isn't it?"

[32] Curiously, another attribute that many *ejidatarios* associated with failure was "use of outside credit." It is not clear why, but one might conjecture that this has to do with fear of losing land pledged as loan collateral.

ejidatarios stating: "this is our land and we will never sell it" (Bouquet, 2009, p. 1396). Government officials rarely admitted that the main goals of Procede were to open the door for the privatization of social property and to incorporate *ejido* land into real estate markets (Smith et al., 2009, p. 195; López and Moguel, 1998, pp. 221-222).[33]

Although rental arrangements are more common in most *ejidos* than land sales transactions, there is some evidence of "selective" reconcentration of land ownership targeting high value *ejido* tracts. De Ita (2006, p. 161) argues that "the reconcentration of land gives rise to a *neolatifundismo* (neo-estate system) built around agrarian capitalists, trans-national agro-industries, and big cattle breeders, that are no longer obstructed by legal limits." One case study, conducted in the state of San Luis Potosí, found that the reform of Article 27 modestly increased land sales to outsiders, which was a matter of concern to community leaders (Smith et al., 2009, pp. 191, 197). A study in Michoacán uncovered evidence of a more pronounced rise in *ejido* land sales after 1992 (Goldring, 1998, p. 165). A case study in the state of Chiapas attempted to gauge whether privatization would increase inequality, as de Ita suggests it will. The study showed that a village characterized by private property holdings exhibited much more landlessness and inequality than an otherwise similar *ejido* in the same municipality (the idea being that the latter was a kind of control group). Such comparisons have led to speculation that the Article 27 reforms will increase inequality (Brown, 1997, pp. 102-110).

In a study conducted in the state of Michoacán, Chollett (2009, pp. 83-86, 90) documented the effects of a transition from sugar cultivation to contract farming of blackberries for trans-national agri-businesses, a process that started in the 1990s. While the trans-nationals themselves own or rent very little land, they have contributed to land concentration and growing

[33] Velázquez (2020, pp. 192-193) found evidence that the Agrarian Attorney's Office actively promoted the adoption of *dominio pleno* (privatization) in some instances.

inequality in the region by favoring larger, wealthier growers that rely on hired hands to do most of the work. Undercapitalized small-scale producers that depend on family labor have been displaced in the process, in some cases migrating out of the area. In another study in Michoacán, De la Vega-Rivera and Merino-Pérez (2021, pp. 5-13) document the concentration of landownership in the form of export-oriented avocado plantations. The reform of Article 27, along with the liberalization of trade and forestry, contributed to a boom in avocado production. Because avocado orchards require large up-front investments and take years to mature, the avocado boom has primarily benefited wealthy farmers. While private avocado orchards now dominate the landscape, a case study for one of the region's Indigenous agrarian communities (similar to an *ejido*) shows how communal land tenure can help prevent increases in land concentration and income inequality, even in the midst of the avocado boom.

An analysis conducted in southern Sonora indicates that the reforms to Article 27 contributed to the conversion of coastal *ejido* property into privately-owned shrimp aquaculture ponds. Whereas, in 1996, *ejidos* owned about 70% of the shrimp farming area, by 2001 their share had fallen to 30%. Difficulty in accessing bank credit, despite the possibility of using *ejido* usufruct rights as "collateral", is one of the major reasons that *ejidatarios* have sold land to private shrimp farmers.[34] In some cases, the private farmers employ *ejidatarios* (Luers, Naylor, and Matson, 2006, pp. 443-444). The combination of growing private shrimp farms, shrinking *ejidos*, and conversion of landholding *ejidatarios* into wage workers likely contributes to social stratification in the region. A case study conducted in Veracruz shows how the 1992 reforms also stimulated the sale of *ejido* land in that state, particularly in areas suitable for cattle grazing. This process contributed to growing social inequality, as common pool resources were privatized

[34] Goldring (1998, p. 165) notes that, at least in the 1990s in Michoacán, "banks were not extending loans collateralized with Procede certificates."

and entrepreneurs acquired *ejido* land (Velázquez, 2020, pp. 180-181, 190). When low-income *ejidatarios* are motivated by necessity to sell their land (one of their few assets) to entrepreneurs looking for bargains, it is not surprising that the result may be increased inequality.

Vázquez (2001) compared the experiences of three very different *ejidos* after the 1992 reform. In San Luis Río Colorado, near the Arizona border, *ejidatarios* converted their land into private property and placed it under the management of a joint venture involving foreign investors with the goal of constructing an industrial park and attracting *maquiladoras*. However, the foreign investors effectively controlled the joint venture, leading to conflicts between *ejidatarios* who supported the arrangement and those who opposed it (pp. 204-212). The two other *ejidos* studied had not been privatized. However, an *ejido* near Acapulco had lost parts of its land to speculators and developers. A resort built on former *ejido* property constructed a wall obstructing access to the beach, thereby eliminating the viability of fishing, which had previously been a major source of livelihood for the *ejido*'s residents (ibid., pp. 244-259). Land tenure in the final *ejido* studied, located in the southern state of Oaxaca, had yet to be seriously affected by the 1992 reforms (ibid., p. 295). In the author's assessment, the first two case studies suggest a process of land concentration, at least in some areas, in which large properties are reappearing, "not as *haciendas*, but in the form of tourist resorts and *maquiladora* factories…" (ibid., p. 314).

As the previous paragraph suggests, some of the most egregious cases of dispossession have occurred in regions that rely heavily on tourism. For example, the State of Chihuahua used a legally questionable ploy to obtain *ejido* land for the construction of a municipal airport, which was part of a strategy for attracting tourists to the Copper Canyon region (Almanza et al., 2020, pp. 343-346). In another example, in the vicinity of Tulum, along Mexico's Caribbean coast, competing claims to beachfront property by *ejidos* and private property owners have led to

contentious legal battles and even occasional outbreaks of violence. While the origin of this conflict predates the 1992 reforms, the formal sale of *ejidatarios'* land, initially for very low prices, dates back to the early 1990s (Marín, 2020, p. 295). Starting in 1994, the state government, in collusion with enterprises that claimed the beachfront as private property, began violently evicting *ejidatarios* from their land. Over the next two decades, the conflict reached a fever pitch with the kidnapping of *ejidatario* leaders and, in 2012, the murder of their lawyer (ibid., pp. 302-306). The violence brought attention to the region's "agrarian mafia" comprised of entrepreneurs, developers, politicians, lawyers, notaries, and brokers engaged in dispossessing *ejidatarios* through deceit, fraud, and coercion (ibid., p. 287).

Examples of *ejido* land being converted into resorts and industrial parks raise the question of whether privatization has been primarily observed in areas undergoing rapid urbanization. The relationship between urbanization and *ejidos* is long and complex. From 1943 onward, the government began expropriating *ejido* lands near large urban areas such as Mexico City, Guadalajara, and Monterrey for housing and commercial development.[35] Although initially intended to benefit squatter communities that had encamped on the urban fringe, the long-run result was that some former *ejido* property near major cities was rather indiscriminately incorporated into private real estate markets (Vázquez, 2001, p. 95-97).[36] After the 1992 reforms, conversion to freehold status (*dominio pleno*) largely replaced expropriation as the means by which *ejido* land was incorporated into urban developments (Varley and Salazar, 2021, pp. 972-975). However, only 27% of formal housing developments authorized by the State of

[35] The state paid for expropriated land at its agricultural value (Vázquez, 2001, pp. 108-109).

[36] Vázquez (2001, pp. 118-119) argues that, in the process of obtaining land for urban growth before 1992, *ejidos* were more likely to be expropriated than private landholdings due to various legal recourses that were available to private landholders but not available to *ejidatarios*.

Mexico within the Mexico City Metropolitan Area are located on former *ejido* property (ibid., pp. 975-978). This suggests that, while there has been considerable privatization of peri-urban *ejido* land, it is not the preferred type of real estate for urban development (ibid., pp. 979-980).

Despite the many challenges described above, *ejidos* have been remarkably resilient. Even though the 1992 reforms eliminated the constitutional right of peasants to petition for land, they did not immediately block all legal avenues to redistribution (Foley, 1995, p. 65). Between 1994 and 1998, as a result of the Zapatista Uprising in Chiapas, almost 1,300 privately-owned farms and ranches were seized by groups of peasants (Bobrow-Strain, 2004, pp. 887). As a result of these land invasions, between 1996 and 2000, 13% of the private agricultural property in Chiapas was transferred in what one state official called "the greatest agrarian reform [in Chiapas] in the last half century" (ibid., pp. 887, 899). The state subsidized the purchase of occupied land but, unlike pre-1992 agrarian reform efforts, landowners were free to reject the payment offered and, in that event, land-seekers were free to approach other property owners to acquire land (ibid., pp. 892-894). Although the distributed land was supposed to be transformed into small private farms, many peasant groups demanded the creation of *ejidos* (de Ita, 2006, pp. 155-156). New *ejidos* were also created as a result of the gradual resolution of backlogged cases (Appendini, 2020, pp. 98-99). Furthermore, the 1992 reforms enabled small proprietors to transform their property into *ejidos* (Torres-Mazuera, 2020, p. 32). A 2006 government report indicated that 1,276 new *ejidos* had been created since the 1992 reforms (Assies, 2008, p. 53).[37]

Not only have new *ejidos* been formed, but land privatization and land sales have been more limited in scope than was originally feared. One reason for the slow pace of land privatization is that private property is subject to taxation while *ejido* agricultural property is not

[37] Contributing to the increase in *ejido* land was the fact that provisions were approved in 1992 to process an agrarian reform backlog of around 4,000 cases (Foley, 1995, p. 68).

(Assies, 2008, p. 54). However, non-economic factors, such as a preference for collective systems of assigning land rights, may also stand in the way of privatization (Zendejas and Mummert, 1998, p. 195). In some *ejidos*, a renewed interest in the collective governance of communal land may have played a role (Hausermann, 2014, pp. 792-796). A case study of one *ejido* in Yucatán suggests that social and historical factors contribute to a deep-seated suspicion that privatization could open the door to dispossession and extreme inequality (Bianet, 2010, pp. 159-163). Goldring (1998, p. 166) notes that "*ejidatarios* often mention the inalienability of *ejido* property to emphasize its distinct and advantageous status." Whatever the cause, by 2007, only 21% of *ejidos* surveyed by Procede had converted part of their land to private property, with around 4.3% of the total land area being thus converted (Romero, 2015, p. 226). Contrary to initial fears, the available statistical evidence does not suggest that privatization and land sales have occurred on a massive scale (Appendini, 2020, p. 98).

While the amendments to Article 27 did not eradicate the *ejidos* and agrarian communities, it is equally true that they did not achieve the dramatic improvements in agricultural productivity that their proponents had advertised. This may be partly due to the persistence of small-scale agricultural production and imperfections in credit and crop insurance markets (Appendini, 2020, pp. 95-97). In any case, the fact that agricultural productivity growth after 1992 was unimpressive also suggests that communal property rights were not the main obstacle holding back productivity growth in the first place. The experience of Mexico in recent decades has not confirmed the conventional wisdom of the New Institutional Economics that secure individual property rights incentivize investment and improve efficiency. Tellingly, multiple economic studies have focused on the effects of land certification on migration, rather than on agricultural productivity (de Janvry et al., 2015; Valsecchi, 2014). Those studies suggest

that the main effect of increased title security was to eliminate *ejidatarios'* incentives to continue farming their land. Whether the de-population of the countryside is desirable or not is hotly debated, but it was clearly not one of the stated goals of the 1992 constitutional reform.

Lessons from History

Two long cycles in property rights regimes can be distinguished. First, there is a parallel between communal property rights in the pre-independence period and in the 1915-1992 period. Limits on the use of communal lands, and prohibitions on their alienation, were shared by pre-conquest *calpulli* and colonial civil and ecclesiastical corporations. In twentieth century Mexico, similar limits on the sale and rental of *ejido* property created "a retaining wall to halt capitalist development in agriculture" (Bartra, 1993, p. 30).[38] Second, efforts to liberalize real estate markets in the 1850s were similar, in broad terms, to those in the 1990s (Foley, 1995, p. 64; Vázquez, 2001, p. 33; Assies, 2008, p. 49; Bouquet, 2009, p. 1393).[39] In the former period, liberals had argued that allowing the sale of land that had been locked up in the "dead hands" of civil and ecclesiastical corporations would invigorate real estate markets, entice investment, and allocate land to its best use (Bartra, 1993, pp. 88-89). The reformers of the 1990s likewise viewed *ejido* property as being tied up by the "dead hands" of communal governance structures (ibid., p. xiii), or as "dead capital." Both reforms implicitly prioritized efficiency. While the

[38] Another scholar wrote, in the same vein, "[t]he ejido land tenure system… can be said to have slowed down the process of disintegration of the peasantry which usually accompanies the development of capitalism in agriculture." (Stavenhagen, 1975, p. 162). A third scholar wrote: "In a way the *ejido* system worked as a growth control mechanism because it did not permit the legal sale of *ejido* land" (Vázquez Castillo, 2001, p. 72).

[39] Interestingly, even the procedures used to divide up community lands and issue individual titles in some regions of Mexico in the late 19th century (Schenk, 1995, p. 19) bear a resemblance to the PROCEDE program. Admirers of the neoliberal reforms generally downplay their similarities to 19th century precedents. For example, the periodization favored by de Janvry et al. (2015, pp. 3129-3130) only distinguishes between "The First Reform" (1914-1992) and "The Second Reform" (from 1992 onward). Omitting the liberal land reform suggests a pattern of linear progress, from weak to strong property rights, rather than cyclical oscillation between legal regimes privileging private property versus those favoring communal property.

liberal reforms contributed to increased inequality, the effects of the neoliberal reforms on equity are not fully clear. Three broad conclusions can be drawn from the historical record.

First, the goals of the revolutionary agrarian reform suggest the appropriate criteria for judging its success or failure. The initial intent of the reform was to address rural economic inequality. In the Plan of Ayala put forward by the Zapatista faction in 1911, the following justification is given for the expropriation of large estates: "the immense majority of Mexican towns and citizens own nothing more than the ground they stand on, suffering the horrors of poverty without being able to better their social condition nor dedicate themselves to industry or agriculture because the farmland, forests, and waters are monopolized in the hands of the few…" (cited in INEHRM, 2019, p. 29). Likewise, the goals of agricultural strategy under Lázaro Cárdenas included creating an egalitarian peasant society in which the collective village would serve as a fundamental economic unit (Sanderson, 1984, p. 57).[40] While the success or failure of the *ejido* experiment can be evaluated by many criteria, its impacts on equity are of foremost importance in determining whether the experiment succeeded in achieving its own goals.

Second, the unintended consequences of the liberal land reforms suggest the hypothesis that privatization of communal landholdings increases inequality. Although the goal of those reforms was to create a rural middle class, the actual result was mass dispossession through the usurpation of former communal lands (Segovia Liga, 2021, p. 255). The mechanisms by which communal and ecclesiastical lands were appropriated by large landholders in nineteenth century Mexico were startlingly similar to the mechanisms used in early modern England (Marx, 1990,

[40] The Mexican Revolution might be seen as opening up a "farmer road" to capitalist development based on smallholders, as opposed to the "Junker road" based on capitalistic large estates or, in the case of Mexico, *haciendas* (Bartra, 1993, pp. 2-3, 85, 94).

Ch. 27; Bartra, 1993, pp. 83-85).[41] However, whereas Marx argued that primitive accumulation in England furthered industrialization, in Mexico "[t]he violence of a primitive accumulation destabilized by the colonial heritage and the imperialist presence… was the underlying cause of the Mexican Revolution" (ibid., p. 32). While the neoliberal land reforms have generally been less coercive than their liberal predecessors, both were based on the long-term goal of converting communal property into private property.[42] Also, recent research finds that Indigenous communities in the nineteenth century did not always oppose the privatization of communal lands (Kourí, 2017, p. 1931), suggesting parallels with the present situation. The natural question, and the hypothesis to be tested, is whether both episodes of reform also share some common outcomes, in particular an increase in inequality.[43]

Third, aside from informing an econometric hypothesis, understanding historical patterns is important in its own right, because the agrarian problems faced today are not entirely new. Much can be learned from the experience of early-twentieth-century revolutionaries and

[41] "The process of forcible expropriation of the people received a new and terrible impulse in the sixteenth century from the Reformation, and the consequent colossal spoliation of church property…. The dissolution of the monasteries, etc., hurled their inmates into the proletariat. The estates of the church were to a large extent given away to rapacious royal favourites, or sold at a nominal price to speculating farmers and townsmen, who drove out the old-established hereditary sub-tenants in great numbers, and threw their holdings together…. Communal property… was an old Teutonic institution which lived on under the cover of feudalism. We have seen how its forcible usurpation… begins at the end of the fifteenth century and extends into the sixteenth…. The advance made by the eighteenth century shows itself in this, that the law itself now becomes the instrument by which the people's land is stolen, although the big farmers made use of their little independent methods as well. The Parliamentary form of the robbery is that of 'Bills for Inclosure of the Commons', in other words decrees by which the landowners grant themselves the people's land as private property, decrees of expropriation of the people…. [T]he systematic theft of communal property was of great assistance, alongside the theft of state domains, in swelling those large farms which were called in the eighteenth century capital farms, or merchant farms, and in 'setting free' the agricultural population as a proletariat for the needs of industry" (Marx, 1990, pp. 881-882, 885-886).

[42] A Mexican Supreme Court ruling from 1900 suggests that, however coercive, disentailment was not *intended* to result in dispossession: "the [1857] Constitution and the laws of Reform, by disentailing the real estate belonging to Indigenous communities, did not have as an objective to dispossess them of the lands that constituted those communities, nor to allow them to be unlawfully taken away; rather the only thing that these laws… sanction is the division of said lands among their possessors or legitimate owners…" (quoted in Marino, 2016, p. 303).

[43] Thompson and Wilson (1994, p. 461) write: "privatization could also lead to a de facto modern day *hacienda* system in some parts of Mexico."

reformers who sought to reconcile conflicting goals of equity and efficiency (although they did not use those terms). Given their familiarity with nineteenth-century Mexican Liberalism, it is highly likely that the intellectual authors of revolutionary-era agrarian reform were aware of the economic and political arguments in favor of strong individual property rights. Some of them even believed that private property was, in the abstract, superior to communal property (Kourí, 2002, pp. 100-113). However, the architects of revolutionary land reform were also pragmatists who recognized that, in a world of vastly asymmetrical power relations, liberal legal institutions did not offer adequate safeguards against coercion. The subordination of private property rights to community prerogatives in the form of social property was thus carefully considered against the backdrop of Mexican history and it should not be dismissed lightly simply because, as some academics are quick to point out, the *ejido* system led to multiple inefficiencies.

The broad pattern of liberal reform, the expansion of *haciendas*, land redistribution, and neoliberal reform had echoes throughout Latin America, although few other countries have carried out land redistributions as extensive as Mexico's (Albertus, 2015, p. 133). For example, the first Peruvian constitution ostensibly conferred land ownership rights on Indigenous peasants, but non-Indigenous elites were, nonetheless, successful in usurping large tracts of that land. In response, farming communities were created in the 1920s where land could not be alienated and, in the 1960s and 1970s, *haciendas* were expropriated to create agrarian cooperatives (de Soto, 2000, pp. 166-168). De Soto acknowledges that nineteenth-century property rights guarantees failed because they led to dispossession, but he also argues that twentieth-century land redistribution failed because it prevented peasants from fully capitalizing on their land assets. The same argument could apply equally to Mexico, given its similar historical experience. However, that analysis neglects the fact that limits on the use of communal property were

instituted specifically to prevent dispossession, and they were largely successful in that regard. In historical fact, if not in economic theory, "imperfect" property rights ensured that peasants kept their land, whereas the creation of land markets and the legal enforcement of private property rights were the primary tools of dispossession.

Research on Inequality in Mexico

The literature suggests that income inequality in Mexico evolved nonlinearly over time. The available statistical data do not permit reliable calculation of standard income inequality measures prior to 1950. From 1950 to 1984, the Gini coefficient in Mexico declined from 0.52 to 0.425 (Székely, 2005). Then, between 1984 and 1994, inequality generally increased. Possible explanations for this reversal include de-unionization (Fairris, 2003) and a sharp decline in the real minimum wage (Bosch and Manacorda, 2010), both of which were associated with the adoption of a neoliberal development model. However, after 1994, inequality began to decrease again, which is what the Stolper-Samuelson Theorem would have predicted to occur when Mexico began liberalizing its trade relations (Esquivel, 2011). Finally, it is possible that the trend in inequality reversed course once again after 2006, although Mexico's two main income surveys provide contradictory evidence in that regard. In any event, income inequality probably did not continue declining after 2006 (Campos-Vázquez and Lustig, 2017). Changes in the stock of human capital and returns to education, among other factors, probably contributed to these fluctuations in inequality over time (Popli, 2011).

A pair of recent studies considers the determinants of income inequality at the municipal level in Mexico. In a cross-sectional analysis using 2015 data, Clément and Piaser (2021) find that municipal transfers and taxes reduce inequality but that increased ethnic diversity tends to

attenuate this affect. Clément and Piaser (2022) observe an inverted-U shaped relationship between education inequality and income inequality across Mexican municipalities. However, these studies do not consider the effect of property institutions on income inequality. While some of the case studies referenced in the preceding section infer a relationship between social property institutions and inequality in Mexico, the econometric literature on this topic is very sparse. Alix-García (2011) studied inequality in asset ownership within and between *ejidos* (but not between *ejidos* and private farms). In general, *ejidos* in the southern and central states of Mexico have lower levels of land inequality, which may suggest the historical continuity of egalitarian pre-Columbian institutions in those areas. While these studies do not directly address the main research question examined below, they do help inform the econometric approach.

Methodology

An econometric procedure will be used to test the hypothesis derived in the historical section, namely that privatization of communal property increases income inequality. The hypothesized mechanism is straightforward. Most evidence indicates that land distribution is more unequal in the private property sector than in the social property sector (Brown, 1997, p. 105; Dunn, 2000, p. 222; López and Moguel, 1998, pp. 210, 216-217). One goal of privatization is to reallocate land from the least efficient to the most efficient producers, which often means transferring land from undercapitalized peasants to producers who have greater access to credit, crop insurance, and productivity-enhancing capital (tractors, harvesters, irrigation equipment, etc.). Relatedly, the 1992 reforms sought to encourage consolidation of small farms into larger farms that could take advantage of economies of scale.[44] In practice, this meant allowing

[44] To encourage larger farms, the 1992 reforms kept in place a pre-existing requirement that *ejido* land could not be passed on to more than one heir (Nuitjen, 2003, p. 488).

concentration of landownership, although still within certain limits (Foley, 1995, p. 65; Nuitjen, 2003, p. 493). Allowing market exchanges of *ejido* land was a key mechanism for achieving land consolidation and increased agricultural investment (Otero, 1998, p. 93). Considering that land is a very important asset for generating income in farming communities, increased land concentration would, other things equal, generate greater income inequality.

The case study by Luers, Naylor, and Matson (2006) notes that, after the 1992 reforms, some *ejidos* lost control of high-value land and that the new owners employed *ejidatarios* for wages. This suggests that the sale of *ejido* land can go hand in hand with proletarianization of the rural population in regions where agribusinesses are increasingly dominant. One might ask: why would *ejidatarios* agree to sell their land if it makes them worse off? One answer is that *ejidatarios* sometimes sell their land to obtain cash in crisis situations, rather than as part of a premeditated business strategy (de Ita, 2006, p. 162; Velázquez, 2020, pp. 173, 181). The sale of land assets to meet emergency needs is likely to have long-run adverse impacts on income-generating capacity once the immediate crisis situation has passed. In this context, the bargaining power of land speculators is increased by their greater patience and ability to selectively add *ejido* land to their portfolio of assets. The power asymmetry between land speculators or agribusinesses and peasant farmers is often ignored in economic assessments of the welfare implications of an unfettered land market. Furthermore, as highlighted by Vázquez (2001) and Marín (2020), land loss is not always the result of voluntary sales.

Three complementary approaches are used to assess the hypothesis that the erosion of social property institutions increases income inequality. First, *ejido* and agrarian community membership is calculated as a percentage of total population in each municipality before and after the 1992 constitutional reform (this variable is labeled *ejido*). *Ejido* membership is used,

rather than land area, for two reasons. First, some *ejidos* own large uncultivated areas, often in deserts or forests, and these large tracts of land might suggest a greater role for *ejidos* in those municipalities than is really justified, based on the number of people who benefit from that land. Second, unlike land area, *ejido* membership applies to individuals and is arguably more apt for a regression analysis using inequality data computed on the basis of individual income (adequate data on land inequality are unavailable). A first-difference regression is used to estimate the impact of the change in *ejido* on the change in income inequality (*ineq*), as shown in (3.1),

$$ineq_{i1} - ineq_{i0} = \alpha_0 + \alpha_1(ejido_{i1} - ejido_{i0}) + (\mathbf{X_{i1}} - \mathbf{X_{i0}})'\mathbf{a} + \varepsilon_i \quad (3.1)$$

where *i* indexes municipalities, the 0 subscript is for the pre-1992 time period and the 1 subscript is for the post-1992 time period, $\mathbf{X}$ is a vector of control variables, and ε is a random disturbance. The hypothesis to be examined is $\alpha_1 < 0$, which would imply that municipalities experiencing larger declines in *ejido* membership between the pre- and post-periods (proportional to population) experienced larger increases in income inequality.

The second approach used to assess the hypothesis is similar but replaces the change in *ejido* with its initial value. This is relevant because Albertus et al. (2016) find that the cumulative amount of land redistributed in a given state has a qualitatively different impact than the amount of land redistributed in the recent past. Although that study used data on *ejido* land area, rather than membership, the basic principle may apply here as well. Including initial values on the right-hand side of the regression equation will allow assessment of the effect of municipality characteristics immediately prior the 1992 reforms on the subsequent evolution of income inequality. The regression equation to be estimated is shown in (3.2).

$$ineq_{i1} - ineq_{i0} = \beta_0 + \beta_1 ejido_{i0} + \mathbf{X_{i0}}'\mathbf{b} + \varepsilon_i \quad (3.2)$$

The hypothesis to be tested is $\beta_1 < 0$, which would indicate that municipalities that had larger concentrations of *ejido* members prior to 1992 had a smaller increases in inequality (or larger decreases). Controlling for a measure of rurality such as population density is critical in all three specifications, but especially so in this case, since there is a risk that *ejido* may be proxying here for a municipality's degree of rurality.

As argued above, *ejido* membership as a share of total population is a better measure of the socio-economic "footprint" of social property institutions in a given municipality, as compared to *ejido* land area. However, one disadvantage of using population-based measures of *ejido* presence is that they cannot directly measure the effect of land sales, which is critical for testing the hypothesis developed in the historical section. Although land sales are negatively correlated with *ejido* membership, the degree of correlation is very weak, partly because land sales are relatively rare overall. Therefore, it is desirable to have a measure of whether sales to outsiders are commonplace in a given *ejido* (a dummy variable denoted *sales*). While land rental is more common than sales in most *ejidos*, there are several reasons to focus on the latter. First, *ejidatarios* who rent out their land still benefit from possessing it as an asset. Second, fears over renewed land concentration primarily stem from land sales markets, rather than rental markets. The most radical provisions of the 1992 reform were those that allowed the privatization and sale of *ejido* land (Appendini, 2020, p. 86). Third, land ownership still carries significant prestige in rural Mexico (Nuitjen, 2003, pp. 482-484), and land sales could have adverse consequences for the social cohesion of rural communities.

The third econometric approach therefore examines the impact of *sales* on income inequality. Despite the critical importance of *ejido* land sales, few studies have focused on that topic (Velázquez, 2020, p. 162). While a handful of valuable case studies addresses aspects of

the sales-inequality relationship, econometric evidence on the effect of land sales on inequality is especially sparse. To help fill this gap in the economic literature, a difference-in-differences estimation approach is employed, as shown in equation (3.3),

$$ineq_{it} = \gamma_1 sales_i + \gamma_2 post92_t + \gamma_3 (sales_i)(post92_t) + \mathbf{X_{it}'c} + \mu_i + \varepsilon_{it} \quad (3.3)$$

where *t* indexes time (pre- and post-1992), *post92* is a dummy variable for observations after the 1992 constitutional reform, and μ represents municipality fixed effects. Because the *sales* variable is a dummy variable measured at the municipality level, it is collinear with the municipality fixed effects, so γ_1 is redundant. The hypothesis is $\gamma_3 > 0$, which would imply that municipalities with frequent *ejido* land sales to non-*ejido*-members had higher levels of income inequality after the 1992 reforms. If the hypothesis is confirmed, it would lend support to the view that the social impact of the 1992 reforms to Article 27 bears some resemblance to the long-term impacts of the Lerdo Law on economic inequality in the 1856-1911 period.

Data

The main source of information regarding social property institutions is the Ejido Census (*Censo Ejidal*). These censuses were conducted in 1935, 1940, 1950, 1960, 1970, 1981, 1991, 2001, and 2007.[45] The units of observation are all *ejidos* and agrarian communities in existence at the time of the census. The census questionnaire was administered through direct interviews with *ejido* officials (INEGI, 2022a; 2022b). For this analysis, data from the 1991 and 2007 censuses will be used to provide information on *ejidos* and agrarian communities just before the 1992 constitutional reform and 15 years afterwards. In terms of the econometric procedure *t* = 0 in 1991 and *t* = 1 in 2007 in this case. The other potential source of information on social

[45] The first agricultural census was conducted in 1930 and contained information on *ejidos*, so it is sometimes grouped together with the Ejido Census series (Romero, 2015).

property is the National Agrarian Registry (RAN), which is designed to provide up-to-date information on land area and membership for each *ejido* and agrarian community. That database can be used to construct timelines of governmental decisions pertaining to each unit's land area and to obtain current snapshots of each unit's membership. However, the RAN database is not designed to provide historical data on changes in membership across time and it also lacks the detailed queries that appear in the census questionnaire. For those reasons, RAN data are not used for this analysis, except as a means of cross-checking information.

The Ejido Census includes information on membership (the number of *ejidatarios* and *comuneros*), which will be divided by municipal population. *Ejidatarios* are *ejido* members and *comuneros* are members of agrarian communities. The *ejido* variable needed to estimate (3.1) and (3.2) is calculated as the sum of *ejidatarios* and *comuneros* as a percentage of total municipal population. The *sales* variable needed to estimate equation (3.3) is obtained from responses to question 46 on the 2007 Ejido Census questionnaire, which is divided into two parts: in this *ejido*, has land been sold to persons outside the *ejido*? And, if so, are the principal buyers of land persons outside the *ejido*? These questions are of critical importance in isolating the key mechanism by which privatization of social property is hypothesized to increase inequality, namely via sale of *ejido* land to non-*ejido*-members. If the answers to both questions are affirmative for at least one *ejido* within a municipality, then *sales* is coded as 1; otherwise, it is coded as 0. The mean value of *sales* in 0.486. The value of *sales* should have been zero for all municipalities prior to 1992 when the sale of *ejido* land was prohibited by federal law (Dower and Pfutze, 2013). Although informal land sales did occasionally occur prior to 1992, the fact that such transactions were illegal, combined with the fact that occupation of a plot of land is difficult to conceal, served as a strong deterrent to such transactions.

Although data on the total land area sold in the last 10 years is also available from the Ejido Census, that variable is not used to measure *sales* because it includes land sold to other *ejido* members, which was never privatized. Another option would be to use data on the change in *ejido* land area from 1991 to 2007 as a proxy for *sales*, but that option must be discarded because a large number of other legal actions exist, besides privatization, which cause changes in *ejido* land area. Those legal actions include expropriation of *ejido* land for government projects and multiple procedures for *adding* land to the social property sector, as occurred in the wake of the Zapatista Uprising (Bobrow-Strain, 2004; de Ita, 2006). Moreover, using responses to census question 46 as a measure of *sales* has the advantage of not relying on correct reporting of land sales to governmental authorities. This is important because official agrarian statistics may understate the extent to which *ejido* lands have been incorporated into private real estate markets (Torres-Mazuera, 2020, pp. 34-36). Formal privatization is more likely to occur in touristic or urban areas, whereas informal privatization is a nationwide phenomenon (ibid., p. 50). According to the hypothesis, both formal and informal privatization of communal land may increase inequality, and responses to question 46 account for both mechanisms.

Estimating equations (3.1) through (3.3) also requires a measure of income inequality. Mexican censuses do not directly measure income. However, a Mexican government agency known as CONEVAL (National Council for the Evaluation of Social Development Policy) generates income inequality estimates by combining income and other data from ENIGH (National Survey of Household Income and Expenditures)[46] with data on covariates of income from the Population and Housing Census. The ENIGH survey does not have a large enough

[46] The income measure used is household net per capita income, which is obtained by adding together the incomes from all household members and then dividing by the size of the household. Included in this estimate are both monetary income (including transfers) and an estimate of nonmonetary income (self-consumption, in-kind gifts, and imputed rent of owner-occupied dwellings) (CONEVAL, 2010, p. 76).

sample size to be representative at the municipality level, so census data are used to derive estimates of municipal-level income inequality using the methodology of Elbers, Lanjouw, and Lanjouw (2003) (CONEVAL, 2010). The specific measure of inequality that is made available by CONEVAL consistently across the relevant timespan is the Gini coefficient. Unfortunately, income inequality measures are only available from CONEVAL using this methodology for 1990, 2000, 2005, and 2010. Because of this, the time indices for the dependent variable (the Gini coefficient), and the non-*ejido* independent variables, are defined at $t = 0$ in 1990 and $t = 1$ in 2010. After 2010, CONEVAL changed its measure of inequality to cover more than just income inequality, so more recent estimates are not directly comparable with the 1990-2010 estimates.

The control variables that comprise the **X** vector were chosen primarily on the basis of existing literature. Székely (2005) observes a strong positive correlation between poverty and inequality in Mexico. Three definitions of poverty are used: (1) nutritional poverty, where per capita income is insufficient for physical nourishment, (2) capability poverty, where income is sufficient for a healthy diet, but insufficient to invest in education and healthcare, and (3) patrimonial poverty, where income is sufficient to cover purchases of food, healthcare, and education, but insufficient to fully cover housing, clothing, and transportation needs. The same approach is used here, where the percentages of the population falling below each of the three poverty thresholds are added as separate control variables. Furthermore, Clément and Piaser (2021) consider municipal-level tax collections as a determinant of income inequality in Mexico. Per capita state-level tax collections are included as a control variable for this analysis because municipal-level data are not available for all municipalities.

Demographic and educational factors can also influence income inequality. Clément and Piaser (2021) note that population density may affect inequality in municipal-level analyses for Mexico, and that variable is therefore included in the regression analysis. Various studies have shown that human capital may likewise impact inequality in Mexico (Clément and Piaser, 2022; Salazar-Cantú, Jaramillo-Garza, Álvarez-De la Rosa, 2015; Popli, 2011). To control for regional variations in human capital, the literacy rate and two measures of educational attainment are included as controls. In a study of Mexican *ejidos*, Alix-García (2011) finds suggestive evidence that the presence of large Indigenous populations reduces observed inequality in landownership. Because the Mexican censuses utilized for this analysis did not inquire directly about race or ethnicity, the best available indicator is the percentage of the population speaking Indigenous languages, which will serve as a proxy for Indigenous identity. Although previous research has shown that unionization affects inequality in Mexico (Fairris, 2003), union coverage data are not available at the municipal level. Moreover, this variable is far more important in urban areas of Mexico than in the rural areas that are the focus of this analysis.

Like the data on income inequality, the poverty data are from CONEVAL. The taxation data are from INEGI's State Public Finances dataset. Data on population density per square kilometer are calculated using census population figures. Literacy rates are calculated using census data for ages 15 and above. The two educational attainment indicators are derived from census data on the population 15 years of age and older with (1) no formal education and (2) attainment of a post-primary diploma. The educational attainment data are calculated as percentages of the total population aged 15 years or older. Finally, the indicator of Indigenous identity is calculated as the percentage of the population 5 years of age or older speaking an

Indigenous language. Only variables that are available from the same source and defined in identical terms in both 1990 and 2010 are included as controls.

The number of municipalities in Mexico increased from 2,403 in 1990 to 2,456 in 2010.[47] Although the CONEVAL data on poverty and inequality were reconstructed to facilitate comparisons across time for a set of 2,454 municipalities from 1990 through 2010, that is not true of the other data sources. Therefore, an interpolation procedure was implemented to make the units of observation uniform across data sources, where those units of observation are consistently defined as the 2,454 municipalities in the CONEVAL dataset. In general, for municipalities that were subdivided, population shares observed in 2000 or 2010 (after subdivision) are assumed to apply to 1990 (see Appendix A for details). Baylis, Garduño-Rivera, and Piras (2012) use a similar approach to estimate values for recently created municipalities (see footnote 3 in that paper). Another data-related issue is that *ejidos* are not coterminous with municipalities, so *ejido* membership sometimes exceeds total population for very small municipalities. This means that the *ejido* variable is not bounded above by 100%. Dower and Pfutze (2013) note that *ejidos* are not always contained within a single municipality's boundaries but argue that this issue only introduces relatively minor measurement error.

Table 3.1 shows the means and standard deviations of the key variables before and after the 1992 reforms to Article 27. Further insight may be gained by disaggregating the summary statistics using definitions of metropolitan zones and rural areas. Tables 3.2 and 3.3 are based on data disaggregated into metropolitan and non-metropolitan subsamples, respectively. Municipalities are defined as metropolitan if they lie within areas identified as such, as of 2000,

[47] The two most recently created municipalities, as of 2010, are not separately included in the CONEVAL inequality dataset. As a result, the dataset that is actually used consists of the 2,454 municipalities that existed before the most recently created municipalities split off.

by the Interinstitutional Group for the Delimitation of Metropolitan Zones, which is comprised by three Mexican government agencies. Tables 3.4 and 3.5 are based on data disaggregated into rural and non-rural subsamples, respectively. The "non-rural" areas are comprised of municipalities where more than 50% of the population lived in localities with 2,500 inhabitants or more as of 2000. Localities with fewer than 2,500 inhabitants are considered "rural" by Mexican government agencies.

As mentioned previously, income inequality in Mexico generally decreased from 1994 to 2006 (Esquivel, 2011; Campos-Vázquez and Lustig, 2017). Thus, it is not surprising that there is an overall decline in the Gini coefficient between 1990 and 2010. More surprisingly, *ejido* and agrarian community membership as a percentage of municipal population *increased* on average from 1991 to 2007, both in rural areas and nationally overall. This attests to the unexpected resiliency of *ejidos* and agrarian communities, which proliferated and grew as a result of the Zapatista Uprising (Bobrow-Strain, 2004; de Ita, 2006), the resolution of backlogged agrarian

Table 3.1 Summary statistics: full sample

	1990/1991		2007/2010	
	mean	std. dev.	mean	std. dev.
Gini Coefficient	0.4009	0.0368	0.3741	0.0488
Ejido Membership	11.68%	13.59	14.23%	20.27
Ejido Land Sales Dummy	0	0	0.4857	0.4999
Nutritional Poverty	37.49%	17.80	31.92%	19.08
Capability Poverty	45.96%	18.41	41.02%	20.61
Patrimonial Poverty	67.10%	16.30	64.81%	19.61
State Taxes Per Capita	8.03	15.81	262.57	245.66
Population Density (/km^2)	211.85	1,115.21	277.82	1,165.91
Literacy Rate	76.96%	14.61	86.01%	9.63
No Formal Schooling	23.30%	13.62	12.85%	8.34
Post-Primary Education	22.84%	14.05	46.00%	14.61
Indigenous Languages	21.01%	32.82	18.99%	30.89
Observations	2,454		2,454	

Table 3.2 Summary statistics: metro areas

	1990/1991		2007/2010	
Variable	mean	std. dev.	mean	std. dev.
Gini Coefficient	0.4274	0.0490	0.4101	0.0374
Ejido Membership	4.18%	4.48	2.75%	3.20
Land Sales Dummy	0	0	0.6901	0.4631
Nutritional Poverty	20.64%	10.98	14.65%	8.35
Capability Poverty	28.27%	12.54	21.66%	10.39
Patrimonial Poverty	51.22%	13.92	45.03%	13.48
State Taxes Per Capita	16.92	35.62	408.18	537.14
Population Density (/km^2)	1,142.12	2,805.90	1,517.56	2,805.55
Literacy Rate	89.23%	6.40	94.76%	3.58
No Formal Schooling	12.01%	6.29	5.61%	3.23
Post-Primary Education	42.54%	13.25	66.18%	10.54
Indigenous Languages	3.93%	9.86	3.04%	7.18
Observations	342		342	

Note: "Metro" denotes municipalities that were defined as part of metropolitan areas, as of 2000, by the Interinstitutional Group for the Delimitation of Metropolitan Zones, which is comprised by three Mexican government agencies.

Table 3.3 Summary statistics: non-metro areas

	1990/1991		2007/2010	
Variable	mean	std. dev.	mean	std. dev.
Gini Coefficient	0.3966	0.0325	0.3683	0.0479
Ejido Membership	12.89%	14.17	16.09%	21.24
Land Sales Dummy	0	0	0.4527	0.4979
Nutritional Poverty	40.21%	17.18	34.71%	18.86
Capability Poverty	48.83%	17.59	44.15%	20.14
Patrimonial Poverty	69.67%	15.16	68.01%	18.54
State Taxes Per Capita	6.59	8.40	238.99	139.74
Population Density (/km^2)	61.21	102.45	77.07	137.11
Literacy Rate	74.98%	14.60	84.59%	9.56
No Formal Schooling	25.13%	13.60	14.02%	8.33
Post-Primary Education	19.65%	11.32	42.73%	12.38
Indigenous Languages	23.77%	34.37	21.57%	32.44
Observations	2,112		2,112	

Note: See the notes for Table 3.2.

Table 3.4 Summary statistics: rural areas

	1990/1991		2007/2010	
Variable	mean	std. dev.	mean	std. dev.
Gini Coefficient	0.3889	0.0280	0.3586	0.0476
Ejido Membership	14.83%	15.92	19.64%	24.13
Ejido Land Sales Dummy	0	0	0.3951	0.4890
Nutritional Poverty	44.51%	16.72	39.21%	18.63
Capability Poverty	53.19%	16.90	49.02%	19.55
Patrimonial Poverty	73.29%	14.15	72.52%	17.18
State Taxes Per Capita	5.67	7.66	224.83	135.84
Population Density (/km^2)	49.10	64.17	59.87	87.19
Literacy Rate	72.47%	15.03	82.90%	9.85
No Formal Schooling	27.32%	14.16	15.28%	8.69
Post-Primary Education	16.03%	8.90	39.50%	11.00
Indigenous Languages	26.83%	35.98	24.93%	34.54
Observations	1,468		1,468	

Note: "Rural" municipalities are those where at least 50% of the population lived in localities with fewer than 2,500 inhabitants as of 2000.

Table 3.5 Summary statistics: non-rural areas

	1990/1991		2007/2010	
Variable	mean	std. dev.	mean	std. dev.
Gini Coefficient	0.4187	0.0408	0.3971	0.0407
Ejido Membership	6.98%	6.74	6.18%	6.88
Ejido Land Sales Dummy	0	0	0.6207	0.4855
Nutritional Poverty	27.02%	13.76	21.05%	13.86
Capability Poverty	35.19%	14.98	29.11%	15.85
Patrimonial Poverty	57.87%	14.86	53.32%	17.22
State Taxes Per Capita	11.55	22.68	318.76	342.82
Population Density (/km^2)	454.15	1,729.99	602.32	1,788.22
Literacy Rate	83.66%	10.97	90.65%	7.11
No Formal Schooling	17.32%	10.16	9.23%	6.24
Post-Primary Education	32.97%	14.21	55.67%	13.94
Indigenous Languages	12.34%	25.09	10.14%	21.64
Observations	986		986	

Note: "Non-rural" municipalities are those where more than 50% of the population lived in localities with 2,500 inhabitants or more as of 2000.

disputes (Romero, 2015; Appendini, 2020), and some *ejidos'* decision to admit new members during the titling process (Velázquez, 2020). However, these overall trends mask considerable regional variation. In 17 of 31 states, the mean of *ejido* declined from 1991 to 2007. Furthermore, membership in *ejidos* and agrarian communities as a percentage of total national population decreased slightly from 4.1% to 3.9% over that timeframe. It is clear from these statistics that municipal-level changes in *ejido* membership since 1992 have been shaped by diverse and contradictory dynamics, some of which eroded social property institutions while others actually revitalized and fortified them (Hausermann, 2014). The sale of *ejido* land to outsiders occurred in both rural and less rural areas, but was more common in the latter.

Tables 3.1-3.5 also show that poverty levels decreased slightly from 1990 to 2010, although the decrease was slightly faster for nutritional and capabilities poverty than for patrimonial poverty, which is consistent with the observed decline in inequality (because it suggests that income increased faster for the poorest households). Per capita state taxes are left in nominal terms because the year-fixed-effect and first-difference strategies control for the nationwide effects of inflation. Fiscal decentralization in Mexico accelerated in the 1990s, which helps explain the low tax figures in 1990 and the increase observed by 2010. Finally, the demographic variables indicate trends of population growth, increasing educational attainment, and a slight decrease in the prevalence of Indigenous languages.

Empirical Results

The baseline estimates of equations (3.1) through (3.3) are shown in tables 3.6 through 3.8. All variables in equation (3.1) are first-differenced (Table 3.6), whereas only the dependent variable is first-differenced in equation (3.2) and the independent variables in that equation correspond to 1990/1991 (Table 3.7). The fixed-effects specification in equation (3.3) is

equivalent to a first-differenced regression, although the *sales* variable cannot technically be first-differenced because it was not observed prior to 1992 when sales of *ejido* land were illegal. For equation (3.3), the estimated municipality fixed effects are not shown and the coefficient for the *sales* dummy variable cannot be estimated because it is collinear with the municipality fixed effects (Table 3.8). Column (1) shows the full specifications including all control variables, whereas column (2) excludes the poverty variables for comparison purposes. Robust standard errors are shown in parentheses. Judging by R-squared and *F*-statistics, the first-differenced and fixed-effects regressions seem to have more explanatory power than the estimates of equation (3.2), which uses initial values of the right-hand-side variables to predict changes in inequality.

Tables 3.6-3.8 suggest that economic conditions have nonlinear impacts on income inequality in Mexico, as has been observed in previous studies (Clément and Piaser 2021; 2022). This can be inferred from the alternating positive and negative coefficients on the poverty variables. In tables 3.6 and 3.8 (column 1), heavier taxation is associated with lower inequality. The estimates in Table 3.7 suggest that areas with higher population density experienced generally greater declines in income inequality from 1990 to 2010, which is consistent with urban-versus-rural trends documented by Esquivel (2011). The human capital coefficients in tables 3.6-3.8 are all positive and a number of them are significantly different from zero. Popli (2011) argues that an increase in the supply of skilled labor in Mexico suppressed inequality, and the estimates in tables 3.6-3.8 suggest that areas with very low levels of educational attainment tend to have high levels of inequality. However, education beyond the primary level and high literacy rates are also associated with greater inequality. Finally, municipalities where a larger share of the population spoke an Indigenous language in 1990 saw larger decreases in inequality by 2010, possibly due to government assistance programs such as Progresa, which began in

1997, and its successor, Oportunidades (Esquivel, 2011). However, municipalities with larger increases in Indigenous population saw larger increases in inequality.

Table 3.6 Equation 3.1 estimates

	(1)	(2)
Δ Ejido $_i$	-0.000177***	-0.000305***
	(0.000048)	(0.000068)
Δ Nutritional Poverty $_i$	0.002356***	
	(0.000203)	
Δ Capability Poverty $_i$	-0.000020	
	(0.000072)	
Δ Patrimonial Poverty $_i$	-0.003604***	
	(0.000197)	
Δ State Taxes Per Capita $_i$	-0.000013***	0.000001
	(0.000004)	(0.000005)
Δ Population Density $_i$	0.000001	0.000004
	(0.000002)	(0.000002)
Δ Literacy Rate $_i$	0.000840***	0.000371
	(0.000309)	(0.000337)
Δ No Formal Schooling $_i$	0.000498*	0.000685**
	(0.000294)	(0.000314)
Δ Post-Primary Education $_i$	0.000847***	0.001786***
	(0.000164)	(0.000192)
Δ Indigenous Languages $_i$	0.000338***	0.000615***
	(0.000112)	(0.000120)
Constant	-0.038756***	-0.062907***
	(0.004635)	(0.005061)
N	2454	2454
F	65.40***	22.59***
Prob (*F*)	0.0000	0.0000
R-squared	0.2609	0.0800

Note: The dependent variable is the change in the Gini coefficient between the pre- and post-reform periods. Robust standard errors are in parentheses. * $p < .10$, ** $p < .05$, *** $p < .01$

The results reported in Table 3.6 provide very modest evidence in support of the first hypothesis regarding membership in *ejidos* and agrarian communities. The estimate in column 1

indicates that changes in membership are inversely related to changes in income inequality across Mexican municipalities. More specifically, the estimate indicates that an increase of one percentage point in *ejido* or agrarian community membership as a share of total population will reduce the municipality's income Gini coefficient by about .000177. This suggests that the observed increase in membership of 2.55 percentage points between 1991 and 2007 can account for only about 2% of the decline in income inequality over that period. Other studies have suggested that factors such as trade, migration, remittances, and education played a much larger role in shaping inequality trends (Esquivel, 2011; Escobar, 2009; Popli, 2011).

For equation (3.2), the estimate implies that municipalities with stronger social property institutions prior to 1992 saw larger decreases in inequality (Table 3.7). More specifically, a positive variation of one percentage point in *ejido* and agrarian community membership as a share of municipal population in 1990 is associated with a 0.000318 unit decline in the income Gini coefficient by 2010. This estimate suggests that, although the presence of social property institutions did contribute to falling inequality, the effect was relatively small. Finally, the estimated interaction term in equation (3.3) implies that municipalities with widespread *ejido* land sales to non-*ejido*-members experienced an increase in their Gini coefficients of .005508 units from 1990 to 2010, on average (Table 3.8). Comparing this with the average Gini coefficients in Table 3.1 suggests that one would expect about 1.4% higher income inequality in municipalities where *ejido* lands are being sold off, on average.

While the estimated effects of social property institutions are small, this may partly reflect the heterogeneity of *ejidos* and agrarian communities. The 1992 reforms reduced the distinction between private and social property in a number of ways and *ejidatarios* in some locales treated their Procede certificates as if they were virtually private property titles (Goldring,

1998; Hausermann, 2014; Velázquez, 2020). In other places, *ejidos* continued to exert a strong social levelling effect (Bianet, 2010). Vázquez (2001, p. 68) notes that *ejidatarios* in different regions of Mexico (north versus south) are far from homogeneous in terms of prosperity and access to credit. Alix-García (2011) finds some evidence that the distribution of land may be

Table 3.7 Equation 3.2 estimates

	(1)	(2)
Ejido (initial value) $_{i0}$	-0.000318***	-0.000321***
	(0.000078)	(0.000088)
Nutritional Poverty $_{i0}$	0.014579***	
	(0.003882)	
Capability Poverty $_{i0}$	-0.020199***	
	(0.005191)	
Patrimonial Poverty $_{i0}$	0.007141***	
	(0.001728)	
State Taxes Per Capita $_{i0}$	0.000118	0.000085
	(0.000101)	(0.000100)
Population Density $_{i0}$	-0.000005***	-0.000006***
	(0.000001)	(0.000001)
Literacy Rate $_{i0}$	0.000380	0.000324
	(0.000292)	(0.000291)
No Formal Schooling $_{i0}$	0.000345	0.000344
	(0.000284)	(0.000283)
Post-Primary Education $_{i0}$	0.000376***	0.000300***
	(0.000117)	(0.000106)
Indigenous Languages $_{i0}$	-0.000074**	-0.000082**
	(0.000037)	(0.000037)
Constant	-0.164469***	-0.060548**
	(0.037471)	(0.028840)
N	2454	2454
F	14.20***	15.81***
Prob (*F*)	0.0000	0.0000
R-squared	0.0659	0.0408

Note: The dependent variable is the change in the Gini coefficient between the pre- and post-reform periods. Robust standard errors are in parentheses. The dependent variable is the Gini coefficient. * $p < .10$, ** $p < .05$, *** $p < .01$

Table 3.8. Equation 3.3 estimates

	(1)	(2)
Sales $_i$ * Post-92 $_t$	0.005508***	0.012171***
	(0.001590)	(0.001753)
Nutritional Poverty $_{it}$	-0.002390	
	(0.001740)	
Capability Poverty $_{it}$	0.006260***	
	(0.002249)	
Patrimonial Poverty $_{it}$	-0.005614***	
	(0.000746)	
State Taxes Per Capita $_{it}$	-0.000012***	0.000000
	(0.000004)	(0.000005)
Population Density $_{it}$	0.000001	0.000003
	(0.000002)	(0.000002)
Literacy Rate $_{it}$	0.000792**	0.000592*
	(0.000319)	(0.000349)
No Formal Schooling $_{it}$	0.000619**	0.000684**
	(0.000300)	(0.000329)
Post-Primary Education $_{it}$	0.000852***	0.001730***
	(0.000162)	(0.000188)
Indigenous Languages $_{it}$	0.000265**	0.000506***
	(0.000114)	(0.000124)
Post 1992 $_t$	-0.041454***	-0.070158***
	(0.004196)	(0.004996)
Constant	0.479038***	0.288545***
	(0.033502)	(0.034540)
N	2454	2454
F	196.55***	158.74***
Prob (*F*)	0.0000	0.0000
R-squared	0.3991	0.2716

Note: The dependent variable is the Gini coefficient. The output shown was estimated by fixed effects regression. Robust standard errors are in parentheses. The dependent variable is the Gini coefficient. * $p < .10$, ** $p < .05$, *** $p < .01$

more egalitarian in Indigenous communities in southern and central Mexico. The heterogeneity of *ejidos*, and their increasing resemblance to private property institutions in some regions, might help explain why the effects reported in tables 3.6-3.8 are smaller than one might infer from case studies such as Brown (1997). Furthermore, the relative infrequency of *ejido* land sales makes

detection of an economically significant effect on overall national-level inequality less likely. The fact that a minor erosion of social property institutions produces a statistically discernible effect on income inequality at all serves as a forewarning of potentially large impacts should a mass selloff of *ejido* lands ever materialize.

A few critical decisions made in constructing the dataset could potentially affect the results reported in tables 3.6-3.8. First, interpolating data for missing municipalities may have introduced bias into the estimates. Although this is impossible to ascertain without the missing data, one way of checking the robustness of the results would be to re-estimate equations (3.1) through (3.3) leaving out municipalities for which interpolations were performed. This involves leaving out not only the newly created municipalities but also any municipality that donated land to them, and it reduces the sample size to 2,352 municipalities. Leaving out the interpolated data has only very minor effects on the key coefficients of interest and does not alter their statistical significance. Another data issue that could potentially bias the results is the existence of some measurement error in the *ejido* variable due to the fact that *ejidos* and agrarian communities are not coterminous with municipalities. Because of this, there is a small number of municipalities where *ejido* and agrarian community membership exceeds total population. As a second robustness check, *ejido* outliers will be eliminated from the sample to make sure they are not driving the results. This requires censoring the 1% largest values of *ejido* and the 1% largest absolute values of its first difference, effectively removing 24 outliers in each case. This increases the magnitude of the *ejido* coefficients by 30% to 60%, suggesting that removing outliers strengthens the case for the hypothesized effects.

Another type of robustness check involves urban-rural differences. As some studies have noted, one of the reasons that *ejido* land is being privatized is urban sprawl (Vázquez, 2001;

Varley and Salazar, 2021). Land values tend to be higher near growing cities and, in that context, it is not surprising that *ejidatarios* sometimes opt to sell their land to speculators and developers. To the extent that urbanization also influences income inequality, it is possible that it is urbanization, and not the sale of *ejido* property *per se*, that accounts for the main results reported in tables 3.6-3.8. That was part of the rationale for including population density as a control variable. A more direct line of attack is to re-estimate equations (3.1) through (3.3) on urban and rural subsamples. If urbanization is driving the key results in tables 3.6-3.8, then the effect of social property institutions on inequality should be observed only in the urban subsample. To account for the graduating effect as smaller urban areas grow into metropolitan centers, definitions of metropolitan status and rurality from different years (1990, 2000, 2010, and 2015) are used. The results for the key parameters of interest are shown in Table 3.9. Also, because population density is itself essentially an indicator of urbanity and rurality, it is excluded from an alternate robustness check, the results of which are shown in Table 3.10.

Estimates of α_1, β_1, and γ_3 from equations (3.1) through (3.3) are shown in tables 3.9 and 3.10 for rural and urban subsamples. In the non-metropolitan / rural areas, all the coefficients have the hypothesized signs. The estimates for equations (3.1) and (3.2) are somewhat smaller in magnitude than what is reported in tables 3.6 and 3.7. On the other hand, the estimates for equation (3.3) are larger than what is reported in Table 3.8. For example, within the rural subsample (where "rural" is defined based on 2000 census data), municipalities where *ejidos* reported substantial land sales to outsiders had Gini coefficients that were .007664 higher, on average (or about 2% higher compared to the 1990 baseline average). The fact that the hypothesized effects are observed in the rural subsample confirms that urban sprawl is not the only factor driving the estimated relationship between *ejidos* and inequality. Social property

institutions do indeed appear to reduce income inequality in rural regions of Mexico, and not just in urban areas.

The results for the urban subsample may also be interesting in their own right, although they are not the main focus of this chapter. When using urban data, as opposed to rural data, the *ejido* coefficients from equation (3.1) maintain their hypothesized negative sign and are generally larger in magnitude. This suggests that the decline of *ejidos* in areas affected by urban

Table 3.9 *Ejido* and *sales* coefficients for rural and urban subsamples (including density)

	Eq 1	Eq 2	Eq 3	
	Δ Ejido	$Ejido_{1991}$	Sales*Post-92	Observations
Non-metro [2000]	-0.000134***	-0.000237***	0.004676***	2112
	(0.000046)	(0.000077)	(0.001652)	
Non-metro [2015]	-0.000125***	-0.000237***	0.005143***	2038
	(0.000046)	(0.000078)	(0.001669)	
Rural [1990]	-0.000107**	-0.000272***	0.007546***	1567
	(0.000046)	(0.000088)	(0.001961)	
Rural [2000]	-0.000092**	-0.000270***	0.007446***	1468
	(0.000046)	(0.000089)	(0.001976)	
Rural [2010]	-0.000083*	-0.000269***	0.006314***	1389
	(0.000046)	(0.000091)	(0.001994)	
Metro [2000]	-0.001648**	0.000972*	-0.007350*	342
	(0.000820)	(0.000575)	(0.004366)	
Metro [2015]	-0.002088***	0.000988**	-0.009241**	416
	(0.000657)	(0.000417)	(0.003918)	
Non-rural [1990]	-0.000450	0.000460**	-0.005129**	887
	(0.000290)	(0.000202)	(0.002471)	
Non-rural [2000]	-0.000365*	0.000321	-0.003258	986
	(0.000209)	(0.000196)	(0.002343)	
Non-rural [2010]	-0.000314	0.000134	-0.001581	1065
	(0.000225)	(0.000176)	(0.002287)	

Note: Robust standard errors are in parentheses. The dependent variable is the Gini coefficient. Control variables are the same as those in column (1) of tables 3.6-3.8. The definition of "rural" used is municipalities where more than 50% of the population lives in localities with fewer than 2,500 inhabitants. The dates in square brackets reflect the year to which each definition of rural or metropolitan applies. * $p < .10$, ** $p < .05$, *** $p < .01$

Table 3.10 *Ejido* and *sales* coefficients for rural and urban subsamples (excluding density)

	Eq 1 Δ Ejido	Eq 2 $Ejido_{1991}$	Eq 3 Sales*Post-92	Observations
Non-metro [2000]	-0.000143***	-0.000251***	0.004753***	2112
	(0.000046)	(0.000078)	(0.001657)	
Non-metro [2015]	-0.000136***	-0.000249***	0.005354***	2038
	(0.000046)	(0.000079)	(0.001674)	
Rural [1990]	-0.000107**	-0.000311***	0.007552***	1567
	(0.000046)	(0.000093)	(0.001960)	
Rural [2000]	-0.000100**	-0.000297***	0.007664***	1468
	(0.000046)	(0.000092)	(0.001984)	
Rural [2010]	-0.000090*	-0.000291***	0.006449***	1389
	(0.000046)	(0.000093)	(0.001995)	
Metro [2000]	-0.001664*	0.000910	-0.007423*	342
	(0.000816)	(0.000557)	(0.004365)	
Metro [2015]	-0.002089**	0.000940**	-0.009238**	416
	(0.000654)	(0.000407)	(0.003923)	
Non-rural [1990]	-0.000450	0.000477**	-0.005111**	887
	(0.000290)	(0.000203)	(0.002473)	
Non-rural [2000]	-0.000365*	0.000339*	-0.003264	986
	(0.000209)	(0.000197)	(0.002345)	
Non-rural [2010]	-0.000314	0.000152	-0.001583	1065
	(0.000225)	(0.000177)	(0.002289)	

Note: Robust standard errors are in parentheses. The dependent variable is the Gini coefficient. Control variables are the same as those in column (1) of tables 3.6-3.8 (excluding density). The definition of "rural" used is municipalities where more than 50% of the population lives in localities with fewer than 2,500 inhabitants. The dates in square brackets reflect the year to which each definition of rural or metropolitan applies. * $p < .10$, ** $p < .05$, *** $p < .01$

sprawl may be one of the reasons for the observed negative correlation between changes in *ejido* membership and changes in income inequality. On the other hand, the *ejido* estimates from equation (3.2) for urban subsamples are positive and sometimes statistically significant. This implies that urbanizing areas that started off with larger *ejido* populations in 1991 experienced larger increases in income inequality by 2010. That is different than what is observed in rural areas, but there are also different forces at play in urban areas. The positive *ejido* coefficients

from equation (3.2) could be consistent with the interpretation given to the negative coefficients from equation (3.1) if urban areas that started off with larger *ejido* populations also experienced larger declines in *ejido* populations. That seems to be true in the metropolitan sample where the correlation coefficient between $ejido_{1991}$ and Δ *ejido* is -.70, compared to a correlation coefficient of only about -.17 in non-metro areas (these figures are roughly the same regardless of whether 2000 or 2015 metro definitions are used).

The estimated *ejido* coefficients from equation (3.3) are also quite different in the urban subsample, where they are negative (in contrast to the rural coefficients and the hypothesis). That would seem to imply that, in urban areas where land sales to entities outside the *ejido* are commonplace, income inequality tended to decline relatively quickly when holding the controls fixed (although that is not always true when controls are omitted). It is not immediately clear why *ejido* land sales would negatively impact inequality in urban areas but not in rural areas. Urban municipalities where *ejido* land sales to outsiders are common also appear to have experienced more rapid declines in poverty and to be comparatively affluent. It is possible that this type of urban development is associated with decreased inequality, although the mechanisms are not obvious. While this subset of results is somewhat puzzling, the striking difference in the effects of *ejido* land sales in urban areas versus rural areas does suggest that different dynamics are at work in the two sectors and that the overall positive impact of land sales on inequality is not simply an artifact of urbanization. The results generally refute the notion that the key outcomes in tables 3.6-3.8 were driven by urbanization rather than social property institutions.

The estimates in tables 3.9 and 3.10 are generally consistent with the argument that the impact of social property institutions on inequality is primarily a rural phenomenon. However, the mechanism advanced in the methodology section, whereby *ejido* land sales feed the

expansion of capital-intensive farms, facilitating the concentration of land and income among wealthy farmers, may only be part of the story. Given the membership growth reported in Table 3.1, it is possible that both the creation of new *ejidos* and the extension of land rights to additional community members within existing *ejidos* may have provided more equal access to land resources in some parts of Mexico, with favorable impacts on inequality. The latter does not contradict the initial hypothesis; it is simply the other side of the same coin. If the erosion of social property institutions opens the door to the proletarianization of the rural population, the unexpected resurgence of those institutions in some regions would be expected to have the opposite effect. Even if the levelling effect of social property institutions has been attenuated by the increasing commodification of land within the *ejido* sector, the results in tables 3.6-3.8 suggest that the distinction between social and private property institutions has nontrivial impacts on equality.

Conclusion

A deep irony in the nature of property rights is that, as Hernando De Soto notes, a great part of their value lies in the possibility of forfeiture. It is precisely because the land can be surrendered that it has value as collateral in a loan contract. Land sales are the primary means by which the market reallocates natural resources to more productive uses. Sales also permit the concentration of land and the exploitation of economies of scale. The efficiency gain from alienable private property and freely functioning land markets comes at the cost of social equity. When peasants are unable to compete in agricultural markets, due to credit constraints, undercapitalization, and a small scale of production, market forces remedy the situation by taking the land out of their hands and placing it in the hands of well-capitalized owners of large

estates. Land sales by cash-strapped peasant farmers, often triggered by short-term emergency needs, can permanently change their social status from landholder to wage worker. Although overt coercion sometimes plays a role in land loss, market forces alone are sufficient in most cases to transfer land from peasant producers to capitalist farmers.

The capacity of markets to deprive peasants of their land, under the cover of private property institutions, has long been recognized in Mexico. The loss of communal village lands in the 1856-1911 period serves as a cautionary tale regarding the potentially disastrous social consequences of overzealous pursuit of U.S.-style private property institutions. Architects of Mexico's revolutionary land reform were acutely aware that, in a world of asymmetrical power relations, strong legal protections on property rights can easily be coopted and turned into tools of legal dispossession. Precisely because of this understanding, they stipulated, in the 1917 Constitution, that "the nation will have at all times the right to impose upon private property the modalities dictated by the public interest" (Estados Unidos Mexicanos, 1934). The inalienability of *ejidos* and agrarian communities, far from being a thoughtless blunder or a politically motivated ploy, was conceived as a bulwark against renewed mass dispossession (Kourí, 2002). As many economists have argued, it is likely that the inalienability of Mexican social property reduced incentives for investment and slowed the transition from a peasant society to an industrial society. If the decision to prioritize equity over efficiency seems misguided to some observers, it should be remembered that rural inequality was a key cause of the Mexican Revolution and inefficiency is sometimes the cost of social peace.

The 1992 reforms to Article 27 of the Constitution were much less ambitious than the 1856 Lerdo Law. This is no doubt partly because the nineteenth-century experience with land privatization left indelible scars. Given the moderation of the 1992 reforms and the high regard

among many farmers for social property institutions, no large-scale selloff of communal property has occurred, although scattered instances of the privatization and sale of *ejido* lands can be found. The 1992 reforms did, however, reduce the distinctiveness of *ejidos* by allowing *ejidatarios* to become absentee landlords, hire farm labor, and enter into joint ventures with foreign and domestic businesses. Against this backdrop, the econometric analysis turns up modest evidence of an inverse relationship between the strength of social property institutions and income inequality. This relationship is observed most consistently in rural parts of Mexico. While the cautious approach of the 1992 reforms has probably contributed to the survival of *ejidos* and agrarian communities, it has also led to more radical proposals that would open the door to mass privatization of *ejido* land (see, for example, Díaz, 2012). One important policy implication of both the historical analysis and the econometric analysis is that large-scale privatization of communal property would almost certainly increase income inequality.

Chapter 4: Trade, Offshoring, and Manufacturing Employment Volatility in Mexico

Introduction

Beginning in the 1980s, Mexico dramatically relaxed its trade restrictions, triggering a boom in imports and exports (Cárdenas, 2010). At the same time, the country sought to entice greater foreign direct investment by slashing local content requirements, import duties, and limits on foreign ownership. As a result of those structural reforms and comparatively low wage costs, many foreign firms decided to relocate labor-intensive operations to Mexico (Kagami, 1998). Manufacturing plants called *maquiladoras*, which receive import tax exemptions to produce articles for export, were pivotal to the integration of Mexico's manufacturing sector into North American supply chains. Although *maquiladoras* predate the structural reforms of the 1980s, they took on new importance as a leading sector of the national economy after Mexico abandoned import substitution strategies and embraced export promotion (Wilson, 1992).

Some have argued that Mexico's trade liberalization and the North American Free Trade Agreement contributed to increased synchronization of U.S. and Mexican business cycles (Torres and Vela, 2003; Chiquiar and Ramos-Francia, 2005). It is also possible that openness to trade and offshoring could affect not only the timing of recessions but their severity too. Bergin, Feenstra, and Hanson (2009) argue that Mexico's *maquiladora* offshoring sector had substantially higher employment volatility than either comparable sectors of the U.S. economy or Mexico's manufacturing industry in general. Higher volatility in Mexico's offshoring sector has implications for the whole economy as it has become increasingly open to trade. In this context, *maquiladoras* "are seen as a channel by which the U.S. exports to Mexico a portion of its employment fluctuations over the business cycle" (ibid., p. 1664). The hypothesis examined in

this analysis is that the manufacturing sectors which are more dependent on exports, imports, and offshoring revenues have higher employment volatility.

Figures 4.1 and 4.2 compare blue-collar employment in sectors with above-average versus below-average *maquila* revenue as a percentage of total revenue from January 2007 to December 2013 and from January 2019 to June 2021, respectively. The figures show blue-collar employment because blue-collar labor is both more volatile than white-collar labor in Mexico and more likely to be employed in *maquiladoras*, so it is generally advisable to compare volatility for blue-collar workers alone (Kaplan, Lederman, and Robertson, 2012), at least when looking at raw data. The series are formed by summing employment over offshoring-intensive sectors (defined as those with above-average *maquila* revenue shares) and non-offshoring sectors. The figures show that offshoring industries tended to have greater employment volatility during the Great Recession and the Pandemic Recession. That aligns with the findings of Bergin, Feenstra, and Hanson (2009) for four *maquiladora* sectors in the 1996-2005 period, indicating that this is not a pattern confined to just one or two recessions.

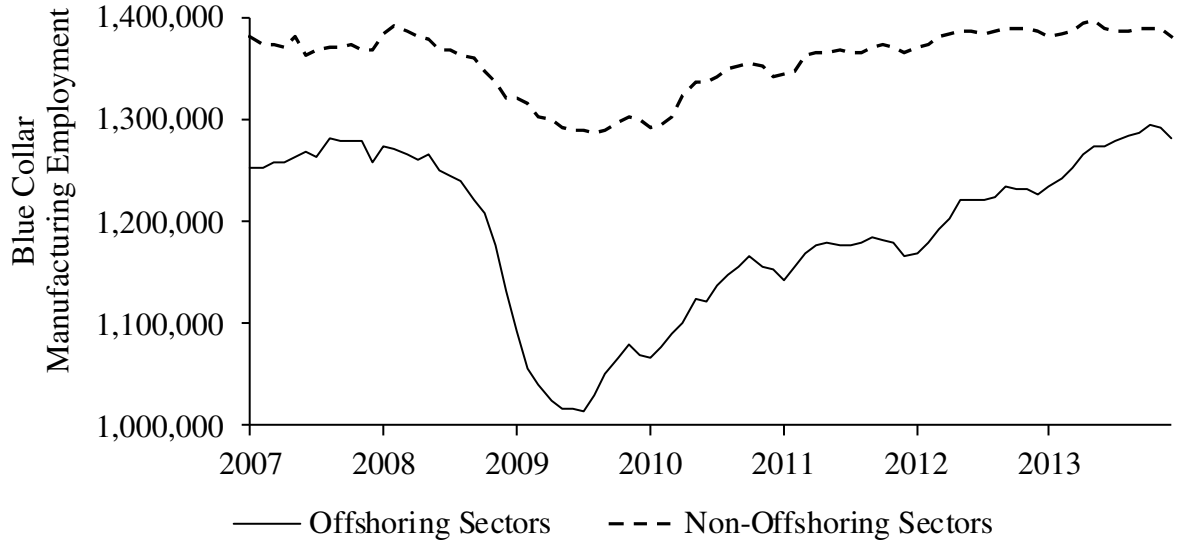

Figure 4.1 Blue-collar manufacturing workers in Mexico, January 2007 to December 2013

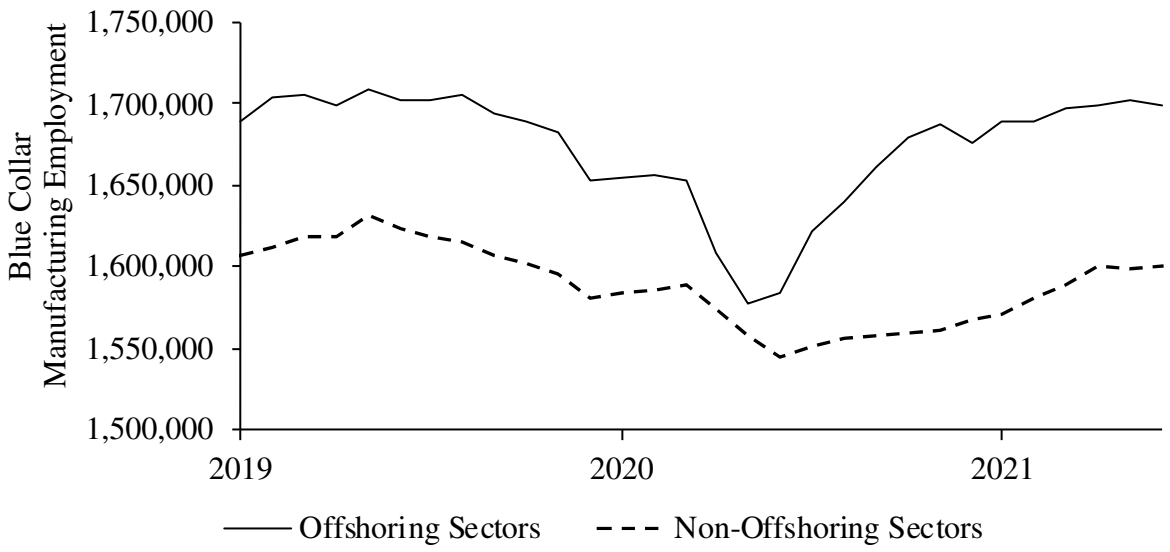

Figure 4.2 Blue-collar manufacturing workers in Mexico, January 2019 to June 2021

High employment volatility is problematic primarily due to the dislocation caused by mass layoffs, but even a boom in employment can create problems in Mexico's urban industrial centers if it causes rapid population growth. In the 1980s and 1990s, the pace of population growth outstripped the expansion of urban infrastructure in several northern Mexican border cities that are closely associated with the *maquiladora* industry (Williams and Homedes, 2001). Electricity grids, paved roads, sanitation services, and water supplies could not keep pace with the rapid influx of migrants seeking *maquiladora* jobs, many of whom initially lived in squatter camps or other irregular settlements with inadequate housing (Enríquez, 2009). However, the health and safety risks posed by haphazard, unplanned urban growth are dwarfed by those caused by the collapse of manufacturing employment during each recession. In addition to the economic strain of mass unemployment, layoffs of young men with limited education made recruitment much easier for organized criminal networks. In a study of the effects of Chinese competition on the Mexican industrial workforce, Dell, Feigenberg, and Teshima (2019) estimate

that a one-standard-deviation decline in manufacturing employment in Mexico from 2007 to 2010 would increase the drug-related homicide rate by 5.4 per 100,000.

The next section surveys previous research on trade, offshoring, and volatility, with a focus on Mexico. In particular, the literature review discusses why, and how, trade and offshoring are expected to influence employment volatility. Next, the evolution of Mexico's *maquiladora* sector is described. That is followed by the empirical methodology, the main results, a discussion, and a conclusion. The key finding of the chapter is that offshoring-related trade has a strong, positive impact on employment volatility in Mexico, whereas trade that is not related to offshoring arrangements has a much weaker effect. These results are explained by reference to the previous literature, which highlights the fact that trade influences employment volatility indirectly, via output markets, whereas offshoring has a direct impact on labor markets. The possibility of substituting foreign workers for domestic workers in response to rising domestic unit labor costs may increase the wage elasticity of labor demand in the offshoring sector. Where labor demand is more responsive to small changes in wages, employment volatility would tend to be higher (Rodrik, 1997). Appendix B explores such potential explanations using a time series approach.

Literature Review

Trade and offshoring have conceptually distinct effects on volatility. That has given rise to separate literatures, which will each be reviewed in turn. Many studies document a positive effect of trade on volatility, although other research has turned up some contradictory evidence. Di Giovanni and Levchenko (2009) report that trade increases output volatility, overall. Industries relying heavily on international trade tend to be more volatile and trade further

augments volatility by encouraging specialization. Although manufacturing subsectors that depend on trade exhibit less co-movement with the rest of the manufacturing sector, which tends to subdue overall volatility, trade still increases output volatility on net. At the micro level, Vannoorenberghe (2012) shows that the share of exports in total sales is positively associated with volatility in total sales for French manufacturing firms. Also using data on French firms, Kramarz, Martin, and Mejean (2020) find that most exporters are heavily dependent on a small number of foreign buyers. Buyer-specific demand shocks account for a large percentage of total firm-level volatility in export sales. The empirical literature thus suggests that trade can serve as a conduit for transmitting volatility from abroad.

On the other hand, trade may reduce volatility by opening up new sources of demand and supply that can offset the effects of adverse shocks in the domestic economy. Caselli et al. (2020) argue that, in view of such dynamics, trade liberalization can reduce income volatility and that it has done so for many countries. A theoretical model suggests that trade can smooth out country-specific shocks by diversifying the sources of demand and supply, provided that the volatility of foreign shocks and the covariance between foreign and domestic shocks are not too large. Although trade-driven specialization does sometimes increase volatility, that effect is outweighed by the quantitatively larger effect of diversification among the countries analyzed. Haddad et al. (2013) find that trade tends to increase output volatility for countries where exports are concentrated in particular products, whereas trade decreases volatility for countries with more diversified exports. These studies do not suggest that trade always decreases volatility, but rather that it can do so under certain, fairly common circumstances.

A few studies have examined the effects of trade on employment volatility in North America. Baldwin and Brown (2004) analyze the relationship between export intensity and

employment volatility across Canadian census divisions from 1976 to 1997. Results using data averaged over the full 22-year sample period suggest that export intensity has a uniformly negative impact on employment volatility. However, regressions using first differences across two 11-year subperiods tell a somewhat different story. The effect of export intensity on volatility is still negative for regions with average employment levels over 1,000 employees, but the effect is positive for smaller regions. This suggests that small, mostly rural, census divisions may suffer greater employment volatility as a result of trade openness. In the case of U.S. manufacturing firms, Kurz and Senses (2016) find that employment volatility is positively associated with both import intensity and export intensity. Firms that import inputs but do not export products tend to have higher volatility, whereas firms that only export, but do not import, tend to have lower levels of volatility.

Some recent research on employment volatility distinguishes between the effects of inter-firm trade versus intra-firm trade. In a study of Japanese firms, Kiyota, Matsuura, and Higuchi (2020) find that export intensity positively affects manufacturing employment volatility only via intra-firm trade. Furthermore, manufacturing employment volatility is generally higher for multinational enterprises than for other firms. Overall, the results suggest that offshoring is an important conduit for the international transmission of supply and demand shocks in Japan's manufacturing sector. For the case of South Korea, Kim (2021) estimates the effect of trade on employment volatility over two five-year windows: 2006-2010 and 2011-2015. When trade is decomposed over the full sample period into intra-firm and inter-firm transactions, only intra-firm trade generally increases volatility. Similar to the results for Japan, these findings suggest that multi-national corporations serve as primary conduits for transmitting foreign shocks. When the results are further decomposed across time periods, shocks are still primarily transmitted

through intra-firm trade from 2006 to 2010, but inter-firm trade played a larger role in propagating foreign demand shocks in the 2011-2015 period.

Published studies that directly link trade exposure to employment volatility have focused primarily on high-income economies. However, some past research conducted for Mexico is also pertinent to this topic. Krebs, Krishna, and Maloney (2010) evaluate the effect of trade policy on income risk using survey data covering the 1987-1998 period, a time during which trade restrictions were significantly relaxed. A decrease in tariff rates is found to increase income risk in industries with high levels of import penetration. Thus, one of the consequences of trade liberalization appears to have been greater income risk. In another study for Mexico using survey data, Cruz (1995) considers employment volatility, but not in relation to trade specifically. The study does, nonetheless, have some relevance to trade and offshoring because it focuses on cities in Mexico's northern border region, where most *maquiladoras* are located. Although this study is limited by the lack of comparison with non-border cities, it does document a seemingly high degree of employment turnover in the export processing centers of northern Mexico. It also suggests that employment volatility is higher for women than for men in the border region.

Studies of employment volatility in Mexico have often taken a macroeconomic approach. Soto (2015) examines the long-run behavior of formal-sector employment and 11 other indicators before and after a structural break, which corresponds roughly to the timing of trade liberalization. For employment, the data begin in 1944 and the structural break was estimated to occur in 1993. The results indicate that the volatility of several macroeconomic variables, including industrial production and formal-sector employment, decreased after trade liberalization. The volatility of imports, exports, and real GDP increased. However, many of the

changes in volatility are relatively small. Also, the correlation between formal employment and real GDP increased substantially after 1993. This suggests that, while employment was less volatile, it was more synchronized with business cycles after trade liberalization. Examining just the 1980-2008 period, Carbajal and Goicoechea (2011) find virtually no change in employment volatility between the pre- and post-liberalization periods.

Another strand of the literature related to trade and volatility concerns synchronization of Mexican and U.S. business cycles. Torres and Vela (2003) show that trade integration between the United States and Mexico led to increasing synchronization of the two countries' business cycles. Chiquiar and Ramos-Francia (2005) highlight that this increasing synchronization was driven not just by trade between the two countries but also by production sharing. However, China's entry into the WTO in 2001 may have weakened cross-border production-sharing linkages between the United States and Mexico. Mejía, Gutiérrez, and Pérez (2006) further note that business cycle synchronization is much stronger in some manufacturing sectors than others. In particular, Mexican industrial sectors dominated by multinational corporations with strong cross-border production-sharing linkages are those most directly connected with the U.S. economy. Finally, Carrillo, Elizondo, and Hernández-Román (2020) find that, in the 2002-2018 period, business cycles were transmitted from the United States to Mexico as much through financial markets as through goods markets.

In summary, trade may have widely varying effects on volatility depending on the specific context considered. Factors influencing the sign of the effect include the volatility of major trading partners and the covariance between domestic and foreign economic cycles. Mexico's high degree of business cycle synchronization with the United States might imply that greater trade flows between those countries could exacerbate employment volatility. However,

notwithstanding aggregate-level business cycle synchronization, it is quite possible that the domestic shocks affecting individual industries may not be highly correlated with shocks emanating from trading partners. Another key message from the review of the trade literature is that intra-firm trade might have different impacts on volatility than inter-firm trade. That possibility is further explored in the subsequent discussion of offshoring and volatility.

Trade based on offshoring and production sharing may have a qualitatively different impact on employment volatility than other forms of trade. One reason for the distinct effect of offshoring-based trade is that it may directly impact labor markets by raising the elasticity of labor demand with respect to wages (Rodrik, 1997, pp. 19-23). The possibility of substituting low-wage foreign workers for high-wage domestic workers, by moving certain stages of production abroad, could increase the wage elasticity of labor demand. If the quantity of labor demanded is highly responsive to small wage changes, this would tend to increase the volatility of employment. Slaughter (2001) documents that the absolute value of the demand elasticity for United States manufacturing production workers increased from 1961 to 1991. However, he finds only weak evidence that the change in demand elasticities can be explained by international trade. Senses (2010) uncovers stronger evidence of a positive linkage between exposure to offshoring and labor demand elasticities for United States manufacturing production workers over the 1972-2001 period. Similarly, Hasan, Mitra, and Ramaswamy (2007) find that trade liberalization positively impacted the absolute value of labor demand elasticities in India.

In a review of previous literature, Crinò (2009) summarizes evidence that offshoring may increase employment volatility by increasing the elasticity of labor demand and by increasing job losses in rich countries. Kleinert, Martin, and Toubal (2015) contend that affiliates of foreign multinational corporations play an outsized role in transmitting economic shocks from their

countries of origin and thereby contribute to international business cycle co-movement. Using data from 24 European countries, Meriküll and Rõõm (2014) find that the presence of foreign-owned companies may lead to higher employment volatility. In general, this could occur because those companies are more sensitive to wage changes in the host country or because they are more exposed to external shocks. However, there is little evidence in the sample considered that labor demand is more elastic for foreign subsidiaries than for domestic firms.

Bergin, Feenstra, and Hanson (2009) study the relationship between offshoring and employment volatility in Mexico using data on the four largest *maquiladora* subsectors over the 1996-2005 period. The main finding is that employment volatility is systematically higher in those four *maquiladora* subsectors than for (1) their counterpart industries in the United States or (2) Mexico's manufacturing sector in general. Bergin, Feenstra, and Hanson (2011) follow up on their earlier empirical paper with a theoretical explanation of the observed high volatility levels in Mexico's offshoring industries. Provided that U.S. wages are procyclical, economic expansions will tend to raise wages and unit labor costs, incentivizing offshoring. While offshoring counteracts the direct employment effects of a positive U.S. demand shock, thus moderating employment growth in that country, it simultaneously fuels rapid job growth in Mexico's offshoring sectors during economic expansions. The converse is true during economic contractions. Dampened wage growth in the U.S. may slow or even reverse offshoring, thus ameliorating the direct employment impact of the negative demand shock north of the border while simultaneously intensifying job losses south of the border. Over the full business cycle, the effects of variations in U.S. wage growth on incentives for offshoring tend to dampen domestic employment cycles while exacerbating those cycles in Mexico.

To summarize, offshoring is closely connected with international trade, particularly trade in intermediate goods. However, beyond the correlation between trade and employment volatility, there are additional reasons why offshoring sectors may be especially prone to boom-and-bust employment cycles. The preceding paragraphs have highlighted two such reasons: (1) the greater ease of substituting foreign for domestic labor in the offshoring sector, which raises labor demand elasticities, and (2) procyclicality of wages in developed countries, which raises incentives to offshore during economic expansions and curtails those incentives during contractions. In both cases, offshoring and international production sharing potentially impact labor markets in ways that ordinary trade does not.

Mexico's *maquiladora* sector is known for its close association with offshoring and cross-border production sharing (Kaplan, Lederman, and Robertson, 2012; Bergin, Feenstra, and Hanson, 2009; Kagami, 1998). In addition, *maquiladoras* account for a sizeable share of Mexico's total export trade (Blyde, 2013). Thus, any analysis that seeks to distinguish the effects of trade versus offshoring in Mexico must deal with the history and characteristics of the *maquiladora* industry. That will be the topic of the next section.

Mexico's *Maquiladora* Industry

In the decades from the end of the Great Depression until 1982, Mexico experienced an unparalleled era of rapid industrialization and economic growth, leading to a large improvement in living standards that has sometimes been called an economic 'miracle' (Minns, 2006, p. 2). Whereas the export sector had traditionally been the leading sector of the national economy, the post-revolutionary governments began a transition towards greater protectionism and state intervention in the economy, which eventually became associated with import-substituting

industrialization policies. This development model began to show signs of weakness in the 1970s and then collapsed in the wake of Mexico's sovereign default in 1982, which ushered in a new era of trade liberalization with a much more limited economic role for the state. However, economic growth since the 1980s has been disappointing by all accounts (Cárdenas, 2010, pp. 503-504; 514). Figure 4.3 juxtaposes real GDP growth in the 1940-1980 import substitution period with that in the 1980-2020 neoliberal period to illustrate that growth has been lower, on average, in the latter period.

Figure 4.3 Real GDP growth rates in Mexico
Source: Based on data from INEGI.

The earliest significant departure from Mexico's inward-oriented development strategy came in 1965, with the establishment of the Border Industrialization Program. The program allowed components and machinery to be imported duty-free, provided they were used to produce articles for export. The components would remain "in-bond" while in Mexico, to ensure that the assembled product would, in fact, be exported (Wilson, 1992, p. 37; Sklair, 1993, p. 44). This gave rise to the "in-bond industry", more commonly known as the *maquiladora* industry. Sklair (1993, p. 10) explains the origin of the name: "In colonial times, the *maquila* was the

portion of flour that the miller kept after grinding the corn. The U.S. companies provide the corn (for example, cut cloth or electronic components), Mexico keeps its portion (U.S. dollars changed into pesos for wages and production costs), and the assembled goods (garments or TVs or auto parts) return to the U.S.". The United States, for its part, only levied tariffs on the portion of the import value that was added in Mexico, thus providing a further incentive for cross-border production sharing (Ganster and Lorey, 2016, p. 112).

Many *maquiladoras* are wholly owned subsidiaries of foreign corporations. However, others are shelter firms that own a plant, hire labor, and handle most interactions with government agencies, while depending on foreign firms for machinery, technology, and components. Still others have only arm's-length relationships with foreign firms (Peres, 1990; Galbraith, DeNoble, and Estavillo, 1990). The ease with which foreign firms can cancel contracts and shelter arrangements may contribute to volatility in the number of *maquiladora* establishments (Montalvo, 2003). While many *maquiladoras* are not foreign-owned, a persistent factor in *maquila* production, regardless of who owns the facilities themselves, is that foreign companies typically maintain ownership of intermediate goods while they are being transformed.

Although the program was initially confined to the immediate border zone, amendments to the customs code in 1972 paved the way for expansion of *maquiladoras* into the interior (Sklair, 1993, p. 140). Further regulatory changes in 1983 allowed *maquiladoras* to sell up to 20% of their production in Mexico, under certain conditions. The limit was raised to 50% in 1989, and relaxed further in 2001 (Ganster and Lorey, 2016, p. 116). *Maquiladora* rules codified in 1971 allowed up to 100% foreign ownership, whereas all other firms operating in Mexico at that time were limited to a maximum of 49% foreign ownership (Wilson, 1992, p. 37). However, relaxation of rules on foreign investment starting in 1989 expanded the possibility of

full foreign ownership to large segments of the economy (ibid., p. 41). In addition to changes in the legal framework, *maquiladoras* have become somewhat more capital-intensive over time (ibid., p. 42), as first-generation plants focusing on labor-intensive production, especially clothing assembly, gave way to second-generation plants engaging in manufacturing, rather than just assembly, in sectors like electronics, appliances, and auto parts (Ganster and Lorey, 2016, p. 120). This transition has also been accompanied by changes in the gender composition of the *maquila* workforce: while 78% of operatives were women in 1975 (Sklair, 1993, p. 167), about half of all workers in the sector were men by the mid-2000's (Ganster and Lorey, 2016, p.116).

As rules regarding foreign investment were relaxed, Mexico also moved to reduce trade barriers, joining the General Agreement on Tariffs and Trade in 1986 and implementing the North American Free Trade Agreement (NAFTA) in 1994. The original rationale for the *maquiladora* program was that it provided an exception to otherwise high tariff barriers (for temporary importation of in-bond components to be assembled and subsequently re-exported). As tariff rates declined, the initial rationale for the program seemed to disappear. Nonetheless, the *maquiladora* industry grew rapidly throughout the 1990s, in part due to the cost advantages conferred by the proximity of Mexico's northern border region to the large U.S. market (Weiler and Zerlentes, 2003). At the same time, NAFTA itself may have had a slight negative effect on *maquiladora* value added, at least in certain industries (Truett and Truett, 2007). More importantly, in terms of employment dynamics, China's entry into the WTO in 2001 and the subsequent gravitation of offshoring production to that country resulted in a large number of *maquiladora* plant closures (Sargent and Mathews, 2009).

Despite all the changes that the industry experienced over the years, the *maquiladora* program always provided tax incentives, including tariff exemptions, for goods temporarily

imported to be used in the production of exports. However, it was not the only such program in Mexico. The Temporary-Importation-for-Reexport Program (PITEX), established in 1985, was another very similar tax incentive program. It was originally designed to help Mexican-owned firms, although the 1989 foreign investment reforms made the two programs almost identical (Wilson, 1992, p. 41). Cypher and Delgado Wise (2010, p. 108) refer to PITEX plants as "disguised *maquilas*." In 2006, the *maquiladora* and PITEX tax programs were merged to form the Manufacturing, Maquila, and Export Services Industry (IMMEX) tax incentive program (Ganster and Lorey, 2016, p. 120). As import duties are now substantially lower than in the past, one of the IMMEX program's main benefits for exporters is that it provides certain exemptions from the national value-added tax for imported goods destined for re-export (SE, 2022).

The original inspiration for *maquiladoras* may have come from Mexican Secretary of Industry and Commerce Octaviano Campos Salas, who reportedly was impressed by the development potential of U.S. assembly plants operating in East Asia (Fernández, 1977, p. 134). The Mexican government hoped that the program would increase demand for domestically produced materials and components (Sklair, 1993, p. 10). While such backward linkages did eventually materialize in Taiwan, Singapore, and South Korea (Wilson, 1992, pp. 23-25), that was not the case for Mexico. The *maquiladora* sector remained a foreign enclave in the domestic economy, especially in the border region, with only 1.5% of components coming from Mexican firms, on average (Ganster and Lorey, 2016, p. 122). The use of domestic inputs was somewhat higher for *maquiladoras* operating in the interior of the country, but was still generally less than 10% of total inputs even there (Wilson, 1992, pp. 46-48).

Wilson (1992, pp. 94, 126) argues that clusters of locally owned *maquiladoras* focused on manufacturing, as opposed to just assembly, have the greatest potential to generate backward

linkages with the domestic economy. To foster such linkages, she recommends targeting investments to the activities most likely to fill gaps in existing supply chains and creating trade associations to provide technical and financial assistance to domestic firms seeking to insert themselves into those supply chains (ibid., p. 125). In practice, fostering backward and forward linkages almost certainly requires government support and intervention. A study of Mexico's information technology sector by Gallagher and Zarsky (2007, pp. 141-142) found that, in the absence of active government industrial policy, foreign firms chose to use foreign suppliers rather than contract with domestic information technology suppliers in a process that virtually eradicated the latter by the mid-2000's. They argue that, without government policies to foster technology transfer and knowledge spillovers to local firms, foreign direct investment will only generate foreign enclaves with little benefit to the domestic economy. As an example of the kind of strategy that might generate knowledge spillovers, they point to an agreement that the Mexican government made with IBM in the 1980s to create a software design and training center, which resulted in a number of Mexican spinoff firms (ibid., p. 179).

Finally, since the focus of this analysis is on volatility, it is worth noting that booms and busts in the *maquiladora* sector have tended to closely follow the U.S. business cycle (Sklair, 1993, pp. 57, 66). Moreover, trade in general appears to be especially sensitive to the business cycle. Nagengast and Stehrer (2016) note that world trade in value added declined by 18.3% during the 2008-2009 "Great Trade Collapse", which is much larger than the corresponding drop in world output. That study finds that changes in international production sharing accounted for more than 40% of the collapse in world trade. However, Bems, Johnson, and Yi (2011) note that the percentage decline in final goods trade was more than twice as large as the fall in intermediate goods trade. The 2020 Pandemic Recession also affected trade flows and may

result in long-term reconfiguration of global supply chains as offshoring is replaced by "reshoring" and long-distance trade relationships are displaced by regionalization (Kersan-Škabić, 2021). However, the short-term effects of the Pandemic Recession in Mexico seem to be comparatively mild, at least in the manufacturing sector. Hoehn-Velasco, Silverio-Murillo, and Balmori (2021) find that job losses were considerably larger in the construction and service sectors than in manufacturing.

Data and Methodology

Data from Mexico's national statistics agency, INEGI, are used to examine the relationship between trade, offshoring, and employment volatility in manufacturing industries. The data are drawn primarily from INEGI's Monthly Survey of the Manufacturing Industry (known by the Spanish acronym, EMIM) and from its Annual Survey of the Manufacturing Industry (EAIM). Data from previous iterations (series) of those surveys have been used in prior economic research (Revenga, 1997; Waldkirch, Nunnenkamp, and Alatorre-Bremont, 2009). Although data from EMIM are available for 2007-2020, comparable data from EAIM are only available since 2009 (see Appendix C). The unit of observation in INEGI's underlying dataset is the manufacturing establishment. However, confidentiality rules do not permit disclosure of data for any industry with fewer than three establishments (INEGI, 2021).

Prior to 2007, *maquiladoras* were excluded from INEGI's principal manufacturing surveys, although data on *maquiladoras* were collected separately from other sources. After changes to the tax code in 2006, which joined the *maquiladora* program with the PITEX export-promotion program to create the new IMMEX program, INEGI revamped its manufacturing surveys to fully cover both domestic-oriented and export-oriented establishments (INEGI, 2021).

The fact that the more recent manufacturing surveys include *maquiladoras*, along with other establishments belonging to the IMMEX program, makes it possible to compare the employment volatility of export-oriented industries with that of domestic-oriented industries.

A fundamental methodological issue facing an analysis of this nature is the definition of employment volatility. Following prior literature, two different volatility measures will be calculated using monthly employment data. The first measure (*sdhp*) is the standard deviation of HP-filtered employment data commonly used in the macroeconomic literature (Bergin, Feenstra, and Hanson, 2009; Soto, 2015). For this metric, the data are first de-seasonalized using the X-11 monthly seasonal adjustment method developed by the U.S. Census Bureau. Natural logarithms of the seasonally adjusted employment data are then calculated. A Hodrick-Prescott filter with a smoothing parameter of 14,400 is used to eliminate the trend component of the logged, de-seasonalized employment data. The standard deviation of HP-filtered employment will serve as the first of the two volatility measures utilized. The second measure (*sdgr*) is analogous to the employment volatility metrics sometimes computed in studies using annual data (Baldwin and Brown, 2004; Kurz and Senses, 2016; Kim, 2021). It is calculated by taking standard deviations of 12-month differences in logged employment, which is an approximate measure of the variability in year-over-year employment growth rates. Following Bergin, Feenstra, and Hanson (2009), the volatility measures are multiplied by 100. Both volatility measures have the advantage of being insensitive to differences in average growth rates. Using two procedures for calculating employment volatility that are mechanically quite different from one another is intended to help gauge robustness.

The main unit of observation is 6-digit NAICS industries. While this is partly due to limitations on the use of firm-level data, the previous literature on firm-level volatility suggests

that there are some advantages to an industry-level analysis. Kurz and Senses (2016) include industry-level results as a robustness check because short-lived firms don't show up in the firm-level data (if there are not enough consecutive observations to reliably calculate volatility for the firm). Also, an analysis where firms are the unit of observation will not capture employment volatility induced by entry and exit of firms, which is the main mechanism by which Bergin, Feenstra, and Hanson (2009; 2011) explain the higher volatility of Mexico's offshoring sector. Finally, an industry-level analysis helps average out firm-specific demand and supply shocks. This may be important because trade-induced volatility at the firm level is often driven by individual firms' reliance on just a few foreign buyers or sellers (Kramarz, Martin, and Mejean, 2020). Prior studies that use industry-level employment data for Mexico include Revenga (1997), Waldkirch, Nunnenkamp, and Alatorre-Bremont (2009), and Bergin, Feenstra, and Hanson (2009).

The most basic empirical approach employed consists of a series of cross-sectional industry-level regressions. However, in order to control for unobserved characteristics of industries that affect their intrinsic degree of employment volatility, a fixed-effects panel-data approach is desirable. Due to confidentiality restrictions, it was not possible to construct a balanced industry-state panel (i.e., many 6-digit NAICS industries have fewer than three establishments in many states). A further potential issue with a state-level analysis is that the manufacturing surveys were designed to be representative at the industry level, but not necessarily at the state level. Although all states are represented in the survey and limited state-level results are reported online for the EMIM survey and its predecessors, only a few dozen manufacturing establishments were sampled in some of the smallest states. These considerations

suggest that it is prudent to maintain industries as the main unit of observation, but to add further dimensions to the dataset in order to control for unobserved industry characteristics.

Geographic variation could be an important dimension to explore given the historical concentration of *maquiladoras* along Mexico's northern border (Cypher and Delgado Wise, 2010, p. 85). For this reason, the data within each industry are broken down into two regions, border and interior, with the former comprising all Mexican states that share a border with the United States. Specifically, the border region includes the states of Baja California, Coahuila, Chihuahua, Nuevo León, Sonora, and Tamaulipas, and the interior region consists of all other states plus Mexico City. In December 2019, the six border states accounted for around 48% of total nationwide manufacturing employment reported in EMIM. Adding a border-interior regional dimension to the dataset comes with a cost, because it reduces the number of industries with full data due to confidentiality restrictions. Some smaller industries that have at least three establishments nationwide do not have three establishments in both the border region and the interior region, and those industries must be excluded from the sample due to insufficient data.

An additional dimension that may matter for employment volatility is time. The fact that volatility is calculated as the standard deviation of time-series data rules out a monthly- or annual-frequency analysis. Firm-level employment volatility studies typically require at least five years of data, or four annual growth rates, to calculate each observation on employment volatility (Kurz and Senses, 2016; Kiyota, Matsuura, and Higuchi, 2020; Kim, 2021). Regional-level and national-level studies have used even longer periods to calculate employment volatility (Baldwin and Brown, 2004; Bergin, Feenstra, and Hanson, 2009). With an industry-level analysis, perhaps even more than with firm-level analyses, the primary source of employment volatility is the business cycle. For that reason, for the baseline results, only two 7-year time

windows are used to analyze employment volatility, so that each volatility observation will be calculated using 84 months of employment data.

The first 7-year time window (January 2007 – December 2013) centers around the Great Recession and the second (January 2014 – December 2020) includes the Pandemic Recession. Mexico's economic recovery faltered in the first quarter of 2013 when year-over-year GDP growth dropped below 1%, so 2013 seems to mark a natural endpoint for the expansionary phase that followed the Great Recession. Sánchez and García (2019) identify that time as the trough of a mild recession, although GDP growth remained positive and the economic expansion subsequently resumed. Also, several major structural reforms were implemented in 2013 and 2014 (Ros, 2017), and those reforms would seem to demarcate a natural breakpoint. To gauge the robustness of the results to alternate time windows, the same procedures that were used to calculate data for the 2007-2013 and 2014-2020 windows are then used to create two other windows for the 24-month periods of 2009-2010 and 2019-2020. The results of econometric analyses using the latter time windows are reported in Appendix D. Both sets of time windows include the troughs of the major recessions that occurred during the sample period.

Following the general approach of studies cited above that measure volatility using annual-frequency employment data, regression equation (4.1) is estimated using a fixed effects approach.

$$\ln \sigma(emp)_{irw} = \beta_0 + \beta_1 M_{irw} + \beta_2 X_{irw} + \beta_3 O_{irw} + \mathbf{Z_{irw}}'\boldsymbol{\alpha} + \mu_i + \delta B_r + \tau P_w + \varepsilon_{irw} \qquad (4.1)$$

In equation (4.1), $\sigma(emp)$ is a measure of employment volatility, *i* indexes industries, *r* indexes geographical regions (border versus interior), *w* indexes multi-year time windows, *M* represents an industry's import intensity, *X* is export intensity, *O* is offshoring intensity, $\mathbf{Z}$ is a vector of control variables, μ represents industry fixed effects, *B* is a border dummy, and *P* is an indicator

equal to zero for the first time window and one for the second window, and ε is a disturbance term. Equation (4.1) will be estimated using both volatility metrics for both total and blue-collar employment. Volatility is calculated separately for blue-collar employment to control for the fact that blue-collar labor has a higher level of volatility and is disproportionately employed in the offshoring-intensive sector (Bergin, Feenstra, and Hanson, 2009; Kaplan, Lederman, and Robertson, 2012). Equation (4.1) can be used to evaluate the hypotheses stated in the introduction, which concern the relationship of employment volatility with imports, exports, and offshoring. The main hypotheses, based on previous literature, are $\beta_1 > 0$, $\beta_2 > 0$ (Kurz and Senses, 2016) and $\beta_3 > 0$ (Bergin, Feenstra, and Hanson, 2009; 2011).

In estimating equation (4.1), the goal is to isolate the effects of trade and offshoring on employment volatility by exploiting variation within industries (a) between the border region and the interior and (b) between the 2007-2013 window and the 2014-2020 window. This is achieved by controlling for the observed covariates plus unobserved characteristics that are constant across industries, regions, or time windows. Using a fixed-effects approach, if the regional dimension is omitted (4.1) reduces to a first-differenced equation, whereas, if the temporal dimension is omitted (4.1) reduces to a regionally differenced equation. It is not clear, *a priori*, whether one would expect higher volatility in the 2007-2013 window or the 2014-2020 window. However, there is a reason, based on the key hypotheses, to expect higher volatility in the region near the U.S. border. The northern border region is more offshoring-intensive than the interior due to its proximity to the United States and the historical concentration of *maquiladoras* near the border. If $\beta_3 > 0$, as hypothesized, then NAICS industries in the border region would be predicted to have higher employment volatility than the same NAICS industries in the

interior, holding other characteristics constant. Examining border-versus-non-border differences within industries will help determine whether the hypothesized effects in fact exist.

Import intensity, *M*, is defined as the real cost of imported intermediate goods used in production as a percentage of real total costs. Intermediate goods, as defined by INEGI, include any directly-owned component used to produce another good, which excludes components used in the production process that belong to a different legal entity. Foreign-owned *maquiladoras* are different legal entities than their parent companies (Sklair, 1993, p. 46), so this definition of import intensity excludes the intermediate goods temporarily imported by *maquiladoras*. Export intensity, *X*, is defined as real net sales in foreign markets as a percentage of real total revenue, where "sales" refers to income from goods produced by the establishment using its own components. Similar to import intensity, this definition of export intensity excludes most exports by *maquiladoras*. Because those exports typically contain "in-bond" components, which are the property of a third party, they do not satisfy INEGI's definition of sales in foreign markets. Although INEGI's variable definitions are a bit different from those commonly used in other countries, due partly to the large size of Mexico's *maquiladora* industry, the trade intensity measures employed here are reasonably close to those used in prior studies of trade impacts on North American labor markets (Baldwin and Brown, 2004; Waldkirch, Nunnenkamp, and Alatorre-Bremont, 2009; Kurz and Senses, 2016).

Offshoring intensity, *O*, is defined as real *maquila* revenue from abroad as a percentage of real total revenue. The term offshoring revenue is used because *maquiladora* production is closely associated with offshoring processes (Bergin, Feenstra, and Hanson, 2009). *Maquila* revenue is income obtained from the industrial transformation of intermediate goods owned by a different legal entity. It only includes the amount billed for value added and does not include the

value of temporarily imported inputs to production. Because the survey instrument does not request the value of intermediate goods owned by third parties, there are no data on the equivalent of *M* for the offshoring sector. It should be noted that the definition of "offshoring" used here excludes revenue from domestic outsourcing and it is also somewhat narrower than other definitions of offshoring found in the literature (e.g., Feenstra, 2017), in that it focuses specifically on "in bond" or *maquiladora*-type offshoring arrangements. Both *O* and *X* are divided by a common denominator. That is because *maquila* revenue and sales revenue, as defined by INEGI, are mutually exclusive components of total revenue (INEGI, 2019b). The availability of data on foreign *maquila* revenue and non-*maquila* foreign sales revenue from the same survey makes it possible to separate out the effects of offshoring on manufacturing employment volatility from the effects of trade more generally.

The **Z** vector includes a number of control variables that have been used in previous studies. Similar to Baldwin and Brown (2004), the absolute value of the mean employment growth rate is included to account for possible correlations between growth rates and volatility (as already mentioned, the variables used to measure employment volatility should eliminate the risk of a spurious correlation between growth trends and volatility). The employment growth rate is approximated by the year-over-year change in the natural logarithm of employment, which is then multiplied by 100. Furthermore, almost all published studies of employment volatility include some measure of industry or firm size as an explanatory variable. Following Kurz and Senses (2016), this analysis uses the natural logarithm of mean industrywide employment as a measure of industry size. To control for differences in capital-intensity across industries, the capital-labor ratio is also included in the analysis (Kiyota, Matsuura, and Higuchi,

2020). Capital is calculated as the value of buildings, machinery, and production equipment, net of depreciation. The ratio is expressed in millions of 2018 pesos per worker.

The share of blue-collar workers or "*obreros*" in total employment is included to control for the tendency of workers in low-skill occupations to experience greater employment volatility, as discussed by Reder (1955) in the U.S. context and by more recent studies in the Mexican context (Bergin, Feenstra, and Hanson, 2009; Kaplan, Lederman, and Robertson, 2012). This metric is similar to the "skill share" variable, which is sometimes calculated as the share of non-production workers in total employment (Kurz and Senses, 2016). The analysis also controls for the share of women in total employment. This is important because Cruz (1995) notes that employment volatility is generally higher for women. Furthermore, Villarreal and Yu (2007) find that women comprise a larger share of employment in *maquiladoras*, as compared to domestically-oriented firms. These two facts, in combination, suggest that it is important to control for the share of women. Gender composition is always measured as a share of total employment, rather than blue-collar employment, because gender composition comes from EAIM surveys whereas the blue- versus white-collar breakdown comes from EMIM, so a cross-tabulation of gender and occupational categories is not possible.

The independent variables are averaged over the two 7-year periods. First, CPI is used to deflate nominal values to make comparisons across years possible, before taking the average. CPI is used as a measure of price levels throughout this analysis as is the case for several other studies of employment dynamics in Mexico (Mollick, 2009; de Jesús-Almonte, Andrés-Rosales, and Carbajal-Suárez, 2020; Saucedo, Ozuna, and Zamora, 2020). The CPI data are from INEGI. Data on the producer price index for the secondary sector of the economy were also collected, but ultimately were not used based on the precedent of previous studies and also because they

Table 4.1 Mean values of key variables by 3-digit NAICS industry

Industry	Industry names	Volatility	Import int.	Export int.	Offshoring int
311	Food Products	4.590	9.061	11.817	0.614
312	Beverages & Tobacco	8.660	5.787	18.443	0.155
313	Textiles & Fabrics	6.142	28.535	25.652	3.325
314	Textile Mill Products	12.183	11.019	16.532	17.593
315	Apparel & Accessories	10.292	10.400	14.128	22.855
316	Leather Products	7.599	10.758	16.660	15.675
321	Wood Products	8.071	7.502	12.922	3.020
322	Paper Mills	5.652	23.646	9.989	4.224
323	Printed Matter	5.073	9.474	5.733	5.770
324	Petroleum & Coal	4.320	9.969	4.617	0.000
325	Chemicals	6.118	22.222	26.996	2.161
326	Plastics & Rubber	6.680	20.838	21.962	12.209
327	Nonmetallic Minerals	6.731	8.901	20.055	6.541
331	Primary Metals	6.579	13.164	30.637	5.384
332	Metal Products	7.463	19.103	21.246	11.871
333	Non-electrical Machinery	11.269	22.021	32.387	10.452
334	Computer & Electronics	10.462	32.750	28.891	53.632
335	Appliances & Components	8.729	19.656	25.892	34.476
336	Transport Equipment	13.772	40.650	41.338	14.517
337	Furniture & Fixtures	7.289	4.928	8.466	31.356
339	Miscellaneous	7.955	17.537	15.152	36.826

Notes: Values represent the mean both across 6-digit industries and over the two time windows based on data from INEGI's EMIM and EAIM surveys. "Volatility" is the standard deviation of growth rates in total employment and "Int." stands for intensity. The short titles for 3-digit NAICS industries are modified slightly from those listed by the U.S. International Trade Commission (https://dataweb.usitc.gov/classification/commodity-description/NAIC/3).

appear to introduce spurious volatility into many of the deflated series (in Mexico, this PPI measure is much more volatile than CPI). Once deflated, the independent variables are then

averaged over each of the two 7-year time windows used to compute employment volatility. Comparable EAIM data begin in 2009, while sector 315229 is missing one year of data, and sector 315991 is missing two years of data. Because of these missing data issues, it is not possible to always include exactly 7 years of data when calculating averages. However, none of the averages are computed using less than 5 years of data and most are computed using the full 7 years. Also, all of the dependent variables are calculated using the full 7 years.

Table 4.1 shows information on four of the key variables for this analysis: employment volatility, import intensity, export intensity, and offshoring intensity. The table displays averages at the level of 3-digit NAICS manufacturing industries for each variable. To save space, only one measure of volatility is shown: the standard deviation of 12-month differences in log monthly total employment. Previous studies have noted that the apparel, electronics, and automotive sectors, corresponding to NAICS sectors 315, 334, 335, and 336, together accounted for a substantial majority of *maquiladora* production and investment (Bergin, Feenstra, and Hanson, 2009; Gallagher and Zarsky, 2007, p. 54). Although the data shown in Table 4.1 are for a later time period, all of those four sectors still have above-average degrees of offshoring intensity. It should be noted that, although offshoring revenue was, on average, only 14.5% of total revenue in the transport equipment sector (336), that is among the largest 3-digit manufacturing sectors, so offshoring income in that sector comprises a substantial fraction of total offshoring income across all sectors. Other industries that have above-average offshoring intensity include two sectors closely related to apparel (314 and 316) as well as furniture and fixtures (337), and the miscellaneous category (339), which includes toys, sporting goods, office supplies, and medical supplies and equipment.

Tables 4.2 and 4.3 show correlation coefficients for four measures of employment volatility and three measures of outward orientation over the 2007-2013 and 2014-2020 time windows. The employment volatility measures, and the measures of import, export, and offshoring intensity, are calculated for each of 239 industries in each of the two time windows and the correlation coefficients are computed using those observations. Logged standard deviations of de-seasonalized, HP-filtered data are denoted *sdhp* and logged standard deviations of year-over-year growth rates are denoted *sdgr*. The four measures of employment volatility are all highly correlated among themselves ($r > .9$). This is somewhat surprising given that the *sdhp* and *sdgr* methods of de-trending and de-seasonalizing the monthly employment data are procedurally quite different from each other. Less surprisingly, blue-collar employment volatility is highly correlated with the volatility of total employment.

The most striking difference between tables 4.2 and 4.3 is that trade intensity was much more strongly correlated with employment volatility in the Great Recession period than in the subsequent period, which includes the 2020 Pandemic Recession. The correlation between employment volatility and trade intensity ranges from .236 to .357 in the 2007-2013 time window but the corresponding figures for the 2014-2020 window range from .029 to .110. It is also interesting that this pattern is less obvious in the case of offshoring intensity, for which the comparable correlation coefficients ranged from .292 to .350 in the 2007-2013 window and from .221 to .256 in the subsequent period. Finally, it is worth noting that, while import and export intensities are highly correlated with each other ($r > .5$), the correlation between those variables and offshoring intensity is close to zero. This is perhaps not surprising given that imports and exports are defined in INEGI's manufacturing surveys to exclude typical *maquiladora* operations

like temporarily importing components owned by a foreign multinational to be assembled in Mexico and then re-exported.

Table 4.2 Correlation coefficients for the 2007-2013 window

	Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1)	*Total Vol. – sdhp*	1.000						
(2)	*Total Vol. – sdgr*	0.977	1.000					
(3)	*Blue-Col. Vol. – sdhp*	0.940	0.908	1.000				
(4)	*Blue-Col. Vol. – sdgr*	0.928	0.939	0.976	1.000			
(5)	*Import Intensity*	0.236	0.253	0.252	0.268	1.000		
(6)	*Export Intensity*	0.308	0.320	0.338	0.357	0.589	1.000	
(7)	*Offshoring Intensity*	0.332	0.350	0.292	0.320	0.081	-0.041	1.000

Notes: The correlation coefficients are calculated for 239 6-digit NAICS industries (in the manufacturing sectors, 31-33) using data from INEGI's EMIM and EAIM surveys. Vol. stands for the natural logarithm of employment volatility, where volatility is measured by the standard deviation of de-trended, de-seasonalized monthly employment; *sdhp* refers to the HP-filtering method; *sdgr* refers to the method of measuring variability in growth rates.

Table 4.3 Correlation coefficients for the 2014-2020 window

	Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1)	*Total Vol. – sdhp*	1.000						
(2)	*Total Vol. – sdgr*	0.968	1.000					
(3)	*Blue-Col. Vol. – sdhp*	0.951	0.915	1.000				
(4)	*Blue-Col. Vol. – sdgr*	0.923	0.948	0.967	1.000			
(5)	*Import Intensity*	0.029	0.076	0.057	0.100	1.000		
(6)	*Export Intensity*	0.063	0.094	0.084	0.110	0.584	1.000	
(7)	*Offshoring Intensity*	0.256	0.251	0.222	0.221	0.103	-0.076	1.000

Notes: See the notes for Table 4.2.

In addition to examining variation across different business cycles, it is also worthwhile to ask how employment volatility and the explanatory variables differ between Mexico's northern border region and the rest of the country. Unfortunately, confidentiality limitations do not permit a cross-regional analysis for the smallest industries (those with fewer than three establishments in either the border region or the interior). Disclosure restrictions limit the

sample for the border-versus-interior analyses to 169 industries. The results of correlation analyses for this subset of industries are generally similar to what is shown in tables 4.2 and 4.3. Table 4.4 shows the mean values of the main variables used in the analysis, disaggregated by both time windows and regions. In general, employment volatility is around 20% to 25% higher in the border region than in the interior. The volatility measures based on HP-filtered de-seasonalized logged data (*sdhp*) are similar in magnitude to those reported by Bergin, Feenstra, and Hanson (2009) for the maquiladora industry in the 1996-2005 period. The average volatility values reported in that study were 4.44 for production workers in four manufacturing industries and 4.20 for total employment in those industries. The 2014-2020 period appears to have been less volatile than the 2007-2013 period, which is consistent with previous findings that the manufacturing sector in Mexico was spared the worst effects of the Pandemic Recession (Hoehn-Velasco, Silverio-Murillo, and Balmori, 2021). Also, consistent with prior research, blue-collar employment is more volatile than total employment.

The absolute values of growth rates are higher in the border region than the interior during the sample period, and the log of manufacturing employment is somewhat smaller in the border states. The proportion of blue-collar employment is persistently higher in the northern border region, compared to interior states, which is consistent with the concentration of *maquiladora* plants in that region, given that those plants rely disproportionately on production workers (Kaplan, Lederman, and Robertson, 2012). Offshoring intensity is much higher in the border region than in the interior, but export and import intensities do not display large differences across regions on average. All three indicators of outward orientation vary widely across industries, ranging from 0% to more than 70%. Although mean offshoring intensity in the interior region is less than 5%, there are some industries in that region where *maquila* revenue

from abroad constitutes around 90% of total revenue, which is consistent with the spread of *maquiladoras* into the interior of Mexico.

Table 4.4 Mean values of employment volatility and explanatory variables

	2007-2013		2014-2020	
	Border	Interior	Border	Interior
Total Vol. - sdhp	5.838	4.653	4.285	3.427
Total Vol. - sdgr	12.302	10.030	8.672	7.181
Blue-Collar Vol. - sdhp	6.521	5.373	4.819	3.821
Blue-Collar Vol. - sdgr	13.633	11.435	9.631	7.881
Total Growth Rate	4.450	3.579	3.334	2.881
Blue-Collar Growth Rate	4.649	3.816	3.440	2.904
Ln (*Total Emp.*)	8.048	8.270	8.238	8.465
Ln (*Blue-Collar Emp.*)	7.819	7.951	8.006	8.156
Capital-Labor Ratio	0.844	0.837	0.871	0.856
Blue-Collar Percent	80.682	73.765	80.389	74.268
Women Percent	28.672	28.848	29.379	29.280
Import Intensity	16.971	18.891	17.403	19.102
Export Intensity	22.150	19.595	23.997	21.017
Offshoring Intensity	28.458	4.238	28.532	4.828

Notes: The table shows mean values calculated from a sample of 169 6-digit NAICS industries in manufacturing sectors using data from INEGI's EMIM and EAIM surveys.

Empirical Results

As a first pass, tables 4.5 and 4.6 show regression results using cross-sectional samples of 239 6-digit manufacturing industries for two 7-year time windows (in the first two columns of results) and an industry-time panel (in the last two columns). Results for total employment volatility are reported in Table 4.5 and those for blue-collar employment volatility are reported in Table 4.6. Given claims that the HP filter introduces spurious dynamic relationships (Hamilton,

2018), which could affect the HP-based volatility measure used in this analysis, the first three columns of results in each table refer to the growth-based measure of employment volatility, and only the last column (the second set of panel results) refers to the HP-based metric. Output from cross-sectional regressions using the HP-based volatility measure (not shown) is similar to the cross-sectional output reported in the tables. More generally, differences in regression results when using *sdhp* versus *sdgr* as the dependent variable are minor and rarely affect the algebraic signs of coefficients or conclusions regarding statistical significance. All panel regressions include industry fixed effects and a dummy variable for the 2014-2020 time window. One constant, across all the tables, is that employment volatility is consistently lower in the 2014-2020 period. Possible explanations of that regularity will be discussed in the next section. Standard errors are clustered on industries. The dependent variables (volatility measures) are logged to facilitate interpretation of the results.

The absolute value of the employment growth rate is strongly related to employment volatility in every regression that was run. The results with *sdgr* as the dependent variable imply a robust positive correlation between the magnitude and variance of employment growth rates. This suggests the importance of controlling for the effect of employment growth rates (Baldwin and Brown, 2004), although that is not done in most prior studies of the trade-volatility relationship. Another variable that is consistently correlated with volatility is the natural logarithm of employment, which is included as a measure of industry size. Smaller industries tend to have more volatility, other things equal. Bergin, Feenstra, and Hanson (2009) consider industry size to be one of the key covariates of employment volatility and Kurz and Senses (2016) find an inverse relationship between industry size and volatility. The effect of the capital-labor ratio is more ambiguous. The cross-sectional regression results suggest that capital-

Table 4.5 Total employment volatility equations

	Cross-sectional results		Industry-time panel results	
	sdgr 07-13	*sdgr* 14-20	*sdgr* 07-20	*sdhp* 07-20
Total Growth Rate	0.04322***	0.06416***	0.05137***	0.04781***
	(0.00764)	(0.01883)	(0.01146)	(0.01059)
Ln (*Total Emp.*)	-0.13618***	-0.18777***	-0.48240***	-0.44436***
	(0.02551)	(0.02153)	(0.14910)	(0.14271)
Capital-Labor Ratio	-0.02778	-0.04514**	0.07132*	0.05842*
	(0.02169)	(0.01965)	(0.04119)	(0.03051)
Blue-Collar Percent	0.01242***	0.01045***	0.00349	0.00615
	(0.00276)	(0.00300)	(0.00508)	(0.00426)
Women Percent	-0.00131	-0.00177	-0.00513	-0.00399
	(0.00200)	(0.00258)	(0.01016)	(0.00987)
Import Intensity	0.00292	0.00101	-0.00711*	-0.00554
	(0.00271)	(0.00261)	(0.00424)	(0.00408)
Export Intensity	0.00701**	0.00310	0.00020	-0.00112
	(0.00274)	(0.00216)	(0.00483)	(0.00469)
Offshoring Intensity	0.00809***	0.00528***	0.00118	0.00140
	(0.00170)	(0.00174)	(0.00495)	(0.00487)
2014-2020 Window			-0.22633***	-0.19633***
			(0.04251)	(0.03892)
Constant	1.87946***	2.33431***	5.96516***	4.67973***
	(0.28702)	(0.26212)	(1.16523)	(1.10464)
Observations	239	239	478	478
R-squared	0.4954	0.3862	0.4365	0.4188
F-statistic	31.058***	20.856***	18.706***	17.670***

Notes: The abbreviation *sdgr* denotes the natural logarithm of the standard deviation of the annual growth rate of employment and *sdhp* denotes the natural logarithm of the standard deviation of de-seasonalized, logged, HP-filtered employment. Cluster-robust standard errors are in parentheses. * $p < .10$, ** $p < .05$, *** $p < .01$

Table 4.6 Blue-collar employment volatility equations

	Cross-sectional results		Industry-time panel results	
	sdgr 07-13	*sdgr* 14-20	*sdgr* 07-20	*sdhp* 07-20
Blue Col. Growth Rate	0.03400***	0.04988***	0.03905***	0.03483***
	(0.00748)	(0.01151)	(0.00790)	(0.00715)
Ln (*Blue Collar Emp.*)	-0.15109***	-0.18927***	-0.38031***	-0.36848***
	(0.02595)	(0.02414)	(0.11981)	(0.11704)
Capital-Labor Ratio	-0.03463**	-0.05243**	0.07686**	0.05757*
	(0.01643)	(0.02041)	(0.03541)	(0.03107)
Blue-Collar Percent	0.00936***	0.00617**	0.00556	0.00787*
	(0.00318)	(0.00295)	(0.00486)	(0.00453)
Women Percent	-0.00180	-0.00087	-0.00621	-0.00426
	(0.00203)	(0.00270)	(0.00928)	(0.00904)
Import Intensity	0.00222	0.00140	-0.00871**	-0.00687*
	(0.00239)	(0.00258)	(0.00402)	(0.00391)
Export Intensity	0.00860***	0.00381*	0.00074	-0.00039
	(0.00218)	(0.00227)	(0.00495)	(0.00479)
Offshoring Intensity	0.00882***	0.00602***	0.00021	0.00113
	(0.00170)	(0.00179)	(0.00490)	(0.00482)
2014-2020 Window			-0.26008***	-0.21898***
			(0.03928)	(0.03767)
Constant	2.35288***	2.72441***	5.03151***	3.98167***
	(0.30972)	(0.24813)	(0.88963)	(0.84111)
Observations	239	239	478	478
R-squared	0.4896	0.3591	0.4111	0.3705
F-statistic	26.675***	19.138***	19.400***	16.614***

Notes: See the notes for Table 4.5. * $p < .10$, ** $p < .05$, *** $p < .01$

intensive industries may be associated with lower volatility, whereas the panel results (the last two columns of tables 4.5 and 4.6) imply a weak positive relationship between capital intensity and employment volatility.

Two of the control variables are included to account for the effects of workforce composition. First, in the cross-sectional regressions, the share of blue-collar workers in the workforce has a strong positive association with employment volatility. This aligns with the argument in Kaplan, Lederman, and Robertson (2012) that production workers and those with less formal education tend to experience higher levels of employment volatility. Somewhat counterintuitively, Table 4.6 suggests that the share of blue-collar workers in total industry employment positively affects volatility not only for all workers, but even when blue-collar workers are considered in isolation. This would imply that, *among blue-collar workers*, those working in industries where they constitute a larger share of total employment tend to experience higher employment volatility. The second workforce compositional measure is the share of women in total employment, which does not have any discernible impact on employment volatility according to the results in tables 4.5 and 4.6.

The estimated effects of trade intensity in tables 4.5 and 4.6 vary substantially depending on whether one examines the cross-sectional or panel results. In the 2007-2013 window, and to a lesser extent in the 2014-2020 window, export intensity is positively associated with volatility. The import intensity coefficients, though positive, are not statistically distinguishable from zero in the cross-sectional regressions. In the panel results, by contrast, the estimated effect of import intensity on volatility is negative, although only one of that variable's four coefficients in tables 4.5 and 4.6 is statistically significant at the 5% level. The export intensity coefficients in the panel regressions are close to zero and statistically insignificant. While the negative coefficients

in the panel analysis might be consistent with the argument of Caselli et al. (2020) that trade suppresses volatility by diversifying the sources of supply and demand shocks, it is probably better to avoid reading too much into these results given that most of the panel coefficients are not significant at the 5% level. The positive and significant effect of export intensity on employment volatility in Mexico over the 2007-2013 period is similar to what Kurz and Senses (2016) documented for the United States in the 1991-2005 period. It provides some limited support to the argument of di Giovanni and Levchenko (2009) that trade tends to increase volatility.

The coefficients for offshoring intensity, unlike those for trade intensity, are always positive in tables 4.5 and 4.6. Those coefficients are statistically significant in the cross-sectional regressions, though not in the industry-time panel regressions. One potential reason for the generally insignificant offshoring estimates in the panel regressions is limited variation in offshoring intensities within industries across time. For 56% of industries, the change in offshoring intensity from the first time window to the second was less than 1 percentage point. *Maquiladoras* tend to concentrate in particular industries, like electronics, and it is relatively rare for industries to switch from being oriented towards the domestic market to being dominated by *maquiladoras* (or vice versa). Despite the insignificance of the panel results, the cross-sectional results do provide some evidence in favor of the hypothesis that offshoring intensity is positively linked with employment volatility. More specifically, the results in Table 4.5 imply that a one-percentage-point increase in offshoring intensity increased the volatility of employment by about 0.81% in the 2007-2013 time window and by 0.53% in the 2014-2020 time window.

Tables 4.5 and 4.6 are useful for assessing the relationship between trade, offshoring, and volatility across industries at the national level. However, as indicated by Table 4.4, mean

values of employment volatility differ substantially between the border and interior regions of Mexico, which may be at least partly attributable to differences in the degree of outward orientation of manufacturing industries in those two regions. To examine this possibility, a regional dimension is added to the dataset by subdividing each industry in each time window into two segments, one for northern border states and the other for the rest of the country. Because data disaggregated in this way are not publicly available, the data were requested from INEGI. Disclosure limitations reduce the number of industries included in this part of the analysis to 169. As already noted, the extent to which particular manufacturing industries are oriented towards foreign markets may not change much over time. However, there are substantial trade-related differences between plants located near the northern border and plants located in the interior within the same industry. Including regional variation results in a richer dataset and allows the creation of separate industry-region panel datasets for each time window, as well as a three-dimensional industry-region-time panel dataset spanning the full 2007-2020 period.

Results for the industry-region and three-dimensional panel analyses are shown in tables 4.7 and 4.8. As before, standard errors are clustered on industries and industry fixed effects are included in all regressions. All regressions now also include border dummies. Many of the results are quite similar to those already documented above, so the following discussion will highlight what is distinctive about this new set of results. First, the capital-labor ratio is no longer a significant predictor of employment volatility in any regression. Second, the percentage of blue-collar workers only exerts a statistically significant impact on total employment volatility in the first time window, and only in the industry-region panel regression. In most cases, controlling for industry fixed effects seems to eliminate the significance of the blue-collar

Table 4.7 Total employment volatility equations, regional analysis

	Industry-region panel results		Three-dimensional panel results	
	sdgr 07-13	*sdgr* 14-20	*sdgr* 07-20	*sdhp* 07-20
Total Growth Rate	0.03513***	0.05961***	0.04062***	0.03822***
	(0.00722)	(0.01434)	(0.00756)	(0.00720)
Ln (*Total Emp.*)	-0.19753***	-0.23250***	-0.23039***	-0.24081***
	(0.03261)	(0.04286)	(0.02868)	(0.02865)
Capital-Labor Ratio	-0.04823	-0.01279	-0.01247	-0.01202
	(0.04810)	(0.04218)	(0.03487)	(0.03924)
Blue-Collar Percent	0.01102***	-0.00165	0.00439	0.00484
	(0.00399)	(0.00588)	(0.00355)	(0.00358)
Women Percent	-0.00141	0.01496***	0.00456	0.00489
	(0.00392)	(0.00469)	(0.00345)	(0.00335)
Import Intensity	0.00180	-0.00136	-0.00021	-0.00019
	(0.00294)	(0.00339)	(0.00168)	(0.00160)
Export Intensity	0.00164	0.00190	0.00222	0.00229
	(0.00234)	(0.00293)	(0.00187)	(0.00174)
Offshoring Intensity	0.00331**	0.00539***	0.00487***	0.00494***
	(0.00161)	(0.00199)	(0.00132)	(0.00141)
Border	0.04138	0.05636	0.03791	0.05599
	(0.05626)	(0.06668)	(0.04666)	(0.04914)
2014-2020 Window			-0.29705***	-0.26173***
			(0.03089)	(0.02905)
Constant	2.79862***	3.18872***	3.35506***	2.64676***
	(0.41416)	(0.54689)	(0.36031)	(0.36439)
Observations	338	338	676	676
R-squared	0.4786	0.4319	0.4625	0.4782
F-statistic	17.503***	17.554***	32.324***	38.905***

Notes: See the notes for Table 4.5. * $p < .10$, ** $p < .05$, *** $p < .01$

Table 4.8 Blue-collar employment volatility equations, regional analysis

	Industry-region panel results		Three-dimensional panel results	
	sdgr 07-13	*sdgr* 14-20	*sdgr* 07-20	*sdhp* 07-20
Blue Col. Growth Rate	0.03430***	0.04666***	0.03373***	0.03235***
	(0.00709)	(0.01125)	(0.00559)	(0.00516)
Ln (*Blue Collar Emp.*)	-0.18908***	-0.23978***	-0.22886***	-0.23576***
	(0.03300)	(0.04457)	(0.02871)	(0.02816)
Capital-Labor Ratio	-0.02993	-0.04571	-0.02428	-0.02531
	(0.05480)	(0.02849)	(0.03646)	(0.04006)
Blue-Collar Percent	0.00326	-0.00257	0.00102	0.00094
	(0.00404)	(0.00503)	(0.00351)	(0.00339)
Women Percent	-0.00030	0.01360***	0.00473	0.00510
	(0.00387)	(0.00453)	(0.00343)	(0.00326)
Import Intensity	0.00245	-0.00164	-0.00007	0.00021
	(0.00299)	(0.00320)	(0.00174)	(0.00163)
Export Intensity	0.00207	0.00181	0.00220	0.00185
	(0.00227)	(0.00282)	(0.00191)	(0.00176)
Offshoring Intensity	0.00365**	0.00509***	0.00459***	0.00441***
	(0.00160)	(0.00178)	(0.00127)	(0.00132)
Border	0.08551	0.07807	0.07396*	0.10437**
	(0.05558)	(0.06234)	(0.04470)	(0.04565)
2014-2020 Window			-0.30849***	-0.26179***
			(0.03374)	(0.03194)
Constant	3.30412***	3.47889***	3.67694***	2.98491***
	(0.38723)	(0.45478)	(0.32518)	(0.32004)
Observations	338	338	676	676
R-squared	0.4283	0.4366	0.4403	0.4503
F-statistic	15.698***	16.982***	32.306***	37.498***

Notes: See the notes for Table 4.5. * $p < .10$, ** $p < .05$, *** $p < .01$

coefficients. In the cases of the capital-labor ratio and the blue-collar share, allowing for border-versus-non-border regional variation, along with industry fixed effects, eliminates most of the effects on volatility that were observed in tables 4.5 and 4.6.

A third important novelty of the results in tables 4.7 and 4.8 is that the share of women in total employment is now positively and significantly associated with volatility during the 2014-2020 period. By contrast, there is no discernible effect of women's employment on volatility during the 2007-2013 time window. This may relate to the finding of Hoehn-Velasco, Silverio-Murillo, and Balmori (2021) that the recovery from the Pandemic Recession was faster for men than for women in Mexico. Similar patterns have been detected in other countries. Alon et al. (2021) note that women's employment declined sharply during the Pandemic Recession, relative to men's employment, in the United States, Canada, and a number of European countries in 2020. Part of this macroeconomic pattern can be explained by the fact that industries employing more women, particularly certain service sectors, experienced some of the worst effects of the Pandemic Recession. However, that would not explain the results presented here, which control for industry-specific effects. Another possible explanation advanced in that study, and one that might explain the results reported here, is that the pandemic increased childcare needs, which disproportionately affected women's employment. The traditional household division of labor may have made women more vulnerable to job losses during the Pandemic Recession.

Fourthly, the distinction between trade and offshoring, in terms of their respective effects on employment volatility, is much starker in tables 4.7 and 4.8 than in the previous two tables. Neither import intensity nor export intensity now has a detectible impact on employment volatility, but offshoring intensity has a strong positive impact. Recalling that exports and

imports are defined by INEGI to exclude *maquila*-type trade, these results suggest that *maquiladoras*, more so than traditional exporters using their own property as inputs, play a key role in explaining the volatility of Mexican manufacturing employment. Although the statistical data used in this analysis are not directly comparable with those used by Kiyota, Matsuura, and Higuchi (2020), their general conclusion that greater intra-firm trade increases manufacturing employment volatility most likely holds true for Mexico. Interestingly, tables 4.7 and 4.8 also suggest that the positive effect of offshoring on volatility was weakest during the Great Recession time window, whereas that window had been associated with the strongest effects in the purely cross-sectional regressions reported in the previous tables.

Using the three-dimensional panel results as a baseline, a one-percentage-point increase in offshoring intensity increases employment volatility by about 0.44% – 0.49%. While these magnitudes are somewhat smaller than the estimates obtained from the cross-sectional regressions reported in tables 4.5 and 4.6, they are substantially larger than the panel estimates from those tables. In other words, the estimated effect of offshoring on volatility is larger when cross-regional variation is incorporated into the panel data analysis. This is most likely because, in the case of Mexico, industry-region panels capture much more variation in offshoring intensity than industry-time panels. The variance of border-versus-non-border differences in offshoring intensity is about 22 times larger than the variance of temporal changes in offshoring intensity between the two time windows. As discussed in the methodology section, cross-regional variation within industries is important for identifying the effects of trade and offshoring on employment volatility.

The fifth and final distinguishing feature of tables 4.7 and 4.8 concerns the border dummy variable. The coefficients on that variable are rather small and statistically insignificant

in most cases. A comparison of the statistics in Table 4.4 indicates that employment volatility in the northern border region is about 20% – 25% higher than in the interior. However, the border dummies in tables 4.7 and 4.8 suggest that going from the interior to the border region increases employment volatility by no more than 11%, and substantially less than that in most cases, when holding the other explanatory variables constant. Much of the difference is explained by a single variable: offshoring intensity. When the regressions are re-run without that variable, the coefficients on the border dummies are 1.9 - 3.7 times larger, becoming statistically significant at the 5% level in all cases, and indicating a border-region effect on volatility on the order of 11% - 22%. Thus, the border region's heavy reliance on *maquila* operations explains a large fraction of that region's higher manufacturing-sector employment volatility.

As previously noted, the regressions reported in tables 4.7 and 4.8 were estimated on a subsample of 169 industries with non-missing data for both the border region and the interior. More specifically, industries with fewer than three establishments in the border region or the interior are excluded from this part of the analysis due to missing data. A possible criticism of the regressions reported in tables 4.7 and 4.8 is that the relationship between trade, offshoring, and volatility may not be the same for the excluded industries as for the (larger) included industries. To check whether there are fundamentally different dynamics in the 169 industries with full regional data, the regressions in tables 4.5 and 4.6 are re-estimated for only those industries. The results of that exercise (not shown) are largely similar to those in tables 4.5 and 4.6. Just as in those tables, a statistically significant impact of offshoring intensity is detected using cross-sectional data, but not when using industry-time panel data. Thus, it appears that the larger estimated effects of offshoring in tables 4.7 and 4.8 (as compared to the panel results in tables 4.5 and 4.6) are due to the inclusion of a regional dimension in the analysis, rather than

being due to divergent dynamics for relatively large (non-missing) versus very small (missing) industries. Finally, the results of another robustness check using different time windows for the analysis are reported in Appendix D.

Discussion

One question that emerges from tables 4.5-4.8 is why employment volatility is consistently lower in the Pandemic Recession period (2014-2020) versus the Great Recession period (2007-2013). Two possibilities stand out. First, Mexico's manufacturing sector lost relatively fewer workers during the Pandemic Recession, as compared to the service sector (Hoehn-Velasco, Silverio-Murillo, and Balmori, 2021). This may be partly due to the fact that the U.S. government pressured the Mexican government to keep *maquiladoras* running during the pandemic to prevent supply chain disruptions for U.S. manufacturers (Kitroeff, 2020). Second, manufacturing employment appears to have experienced a smaller decline than manufacturing production during the pandemic, in the case of Mexico. Statistics from INEGI indicate that manufacturing production declined by about 39% from February 2020 to April 2020, while hours worked declined by about 25%. The trough in manufacturing employment came a bit later, in June 2020, but employment and the wage bill only declined by about 3% compared to their February values. The relative inflexibility of employment and wages, despite the large drop in output, could be due to factors such rigid worker dismissal regulations (WEF, 2018) in the context of a temporary adverse demand shock.

The empirical results also contribute to the literature on trade liberalization in Mexico. Although the present analysis does not address the effects of trade liberalization *per se*, which occurred prior to the beginning of the sample period, it is relevant to that literature because the

growth of exports, imports, and production sharing in Mexico was initially catalyzed by the liberalization of trade and investment. Several comparisons with that literature can be made. First, the results reported here do not offer broad support for the hypothesis that greater import and export intensity outside the offshoring sector increased manufacturing employment volatility over the 2007-2020 window, with the possible exception of the Great Recession subperiod. Similarly, studies of Mexico's trade liberalization have found that it had no effect on aggregate employment volatility (Carbajal and Goicoechea, 2011), or that it may have even reduced volatility (Soto, 2015). Nonetheless, most of the import and export intensity coefficients in tables 4.5-4.8 are positive, which does not support the view that trade exposure actually decreased employment volatility in the manufacturing sector over the 2007-2020 period.

In contrast to most of the literature on the effects of Mexico's trade liberalization, this chapter draws attention to the distinction between offshoring intensity versus general trade intensity. According to the regression results reported in tables 4.5-4.8, the type of trade that most clearly exacerbated employment volatility in Mexico over the 2007-2020 period is trade associated with production-sharing operations typical of *maquiladoras*. The distinct effect of offshoring-related trade is often neglected, partly because the explosive growth of Mexico's *maquiladora* sector in the 1980s and 1990s was inextricably linked with trade liberalization. Prior literature has found that trade liberalization in Mexico resulted in stagnant or declining real wages (Revenga, 1997), rising wage inequality (Feliciano, 2001), and greater individual income risk (Krebs, Krishna, and Maloney, 2010). However, the striking differences in the volatility effects of trade intensity versus offshoring intensity highlight the need to disentangle trade liberalization *per se* from the growth of offshoring in the form of *maquiladoras*. Recent studies

for Japan and South Korea highlight a similar distinction, that between inter-firm and intra-firm trade (Kiyota, Matsuura, and Higuchi, 2020; Kim, 2021).

Prior literature helps explain why offshoring is associated with boom-and-bust employment cycles, whereas ordinary trade does not seem to have a pronounced effect on employment volatility in Mexico. First, the theoretical effect of trade on volatility is ambiguous. On the one hand, trade increases exposure to foreign supply and demand shocks, which can exacerbate volatility (di Giovanni and Levchenko, 2009). On the other hand, trade may help diversify the sources of supply and demand shocks, leading to reduced volatility (Caselli et al., 2020). Given this theoretical ambiguity, it is not surprising that previous empirical research for North America finds a complex, multifaceted relationship between trade and employment volatility (Baldwin and Brown, 2004; Kurz and Senses, 2016). Similar to those studies, the mixed effects of non-offshoring trade reported in this analysis for Mexico could be explained by the fact that trade merely increases exposure to shocks originating in other economies, which may either exacerbate cycles in the domestic economy or help smooth them out.

The effect of offshoring on volatility, in contrast, involves not just the consequences of greater exposure to foreign product markets, but also the labor-market ramifications of competition between countries for outsourcing contracts and foreign direct investment. The offshoring sector exists because of substitution between foreign and domestic workers in response to changing unit labor costs. In that context, the effects of wages on the quantity of labor demanded are amplified, increasing volatility in hours worked (Rodrik, 1997, pp. 12-13). Furthermore, procyclical wages in the offshoring sectors of high-wage countries may result in increased offshoring during economic expansions followed by decreased offshoring during contractions. The end result could be greater employment volatility in the offshoring sectors of

low-wages countries (Bergin, Feenstra, and Hanson, 2011). The rapid growth of Mexico's auto parts industry due to foreign direct investment inflows between 2003 and 2007 (Cypher and Delgado Wise, 2010, p. 118) may be an example of this type of mechanism operating during a business cycle expansion phase. Appendix B suggests a framework for assessing the importance of such mechanisms in explaining the greater employment volatility of the offshoring sector in Mexico. It seems plausible that the distinct effects of offshoring intensity reported in this chapter could be explained by the theoretical arguments outlined above.

This chapter also has some relevance to the literature on cross-border business cycle synchronization. Although the focus of this analysis is on the severity, rather than the timing, of business cycles, trade and offshoring are often cited as conduits by which U.S. business cycles are transmitted to Mexico (Torres and Vela, 2003; Chiquiar and Ramos-Francia, 2005). One study found that the presence of an affiliate of a foreign multinational corporation in a given region of France increases business cycle co-movement with the country where that affiliate's parent corporation is located (Kleinert, Martin, and Toubal, 2015). Similarly, the presence of *maquiladoras* affiliated with U.S. multinational corporations in Mexico's manufacturing industries may contribute to the transmission of business cycles from the United States to Mexico, although further research is needed to evaluate such linkages. Mejía, Gutiérrez, and Pérez (2006) note that the manufacturing sectors with the strongest external linkages were the most sensitive to slowdowns in the U.S. economy. That argument dovetails with the finding here that offshoring-intensive manufacturing industries have higher employment volatility.

Conclusion and Policy Implications

This analysis takes advantage of the availability of data on two distinct types of trade relationships involving Mexican manufacturing establishments. Official statistics distinguish between exports fabricated using directly-owned inputs versus offshoring revenues for processing foreign-owned intermediate goods destined for re-export. The main conclusion of the analysis is that manufacturing industries that rely more on offshoring revenues tend to have higher employment volatility in Mexico over the 2007-2020 time period. This is most clearly evident in the regressions that consider border-versus-interior variation within industries. The results for trade intensity are less clearcut. While there is some evidence that export intensity was associated with higher employment volatility during the Great Recession period, regressions that control for industry fixed effects generally do not indicate a strong impact of export or import intensity. The import intensity coefficient is only statistically significant at the 5% level in one regression equation, and in that case the coefficient is negative (although those results are modified slightly when shorter time windows are used, according to tables D.1 and D.2 in Appendix D). While most of the non-offshoring trade intensity coefficients are positive, the results do not suggest a strong and consistent effect on employment volatility.

This chapter contributes to the literature in several ways. First, it highlights that manufacturing employment volatility in Mexico is more strongly impacted by offshoring-related trade than by other forms of trade. Prior literature suggests potential reasons for this difference, which are mainly based on the idea that offshoring directly affects labor markets in ways that ordinary trade does not. In particular, offshoring may make employment more sensitive to wage fluctuations (Rodrik, 1997; Bergin, Feenstra, and Hanson, 2011). Appendix B develops that logic further. Second, this chapter identifies a key source of cross-regional variation in Mexican

employment volatility. Specifically, it finds that the higher degree of manufacturing employment volatility in Mexico's northern border region can be explained largely by the heavy concentration of *maquiladoras* in that region. Volatility would be expected to increase in the interior of the country as cross-border production sharing arrangements spread inland from the border. Third, the chapter contributes to literature comparing the Great Recession with the Pandemic Recession. In particular, it calls attention to the fact that the latter recession had less severe employment impacts in the case of Mexico's manufacturing sector.

As described in the introduction, employment volatility is associated with a number of undesirable consequences. The natural question, then, is: how can the volatility of Mexico's manufacturing sector be reduced? One approach would be to strengthen existing labor laws by making it more costly to fire workers during cyclical economic downturns. It was already noted that the relatively small impact of the 2020 recession on employment volatility in Mexico (compared to both employment volatility in the United States and output volatility in Mexico) may be due partly to Mexico's somewhat rigid worker dismissal rules. Labor laws, however, are likely to be less effective at reducing employment volatility for long-lasting economic downturns and they would not prevent firms from relocating to countries that offer lower wage costs.

Another approach to reducing employment volatility would be to foster the development of sectors where *maquiladora* production is less pervasive. For example, Table 4.1 indicates that sectors that are below average in terms of both offshoring intensity and employment volatility include: food processing, paper mills, chemical manufacturing (including medicine), nonmetallic mineral product manufacturing (clay, glass, cement, etc.), and primary metal manufacturing (iron, steel, aluminum, etc.). An interesting contribution with regard to the food processing sector finds that employment growth in that sector contributes to poverty reduction in Mexico

and Chile (Cazzuffi, Pereira-López, and Soloaga, 2017). While that study is concerned with poverty and not employment volatility, it suggests that certain types of manufacturing industries have intrinsic qualities that are conducive to stable economic development.

Favoring certain types of manufacturing industries over others would, however, be an indirect solution that does not address the key policy-related variable identified in this analysis: offshoring intensity. A more direct approach to reducing employment volatility would involve limiting the national economy's dependence on the offshoring sector and thereby limiting the risk that employment will collapse every time large numbers of multinational enterprises decide to relocate operations from Mexico to other countries. That certainly does not entail eliminating the offshoring sector, but only removing its current privileged status under Mexican law. It has been noted that tax incentives for temporarily importing intermediate goods tilt the playing field in favor of foreign firms, especially those of the *maquiladora* variety (Gallagher and Zarsky, 2007, pp. 153, 155). It is important to remember that the original *maquiladora* program, together with PITEX and now IMMEX, are all *tax incentive programs* to promote exports (SE, 2022). Firms benefitting from the IMMEX program thus enjoy special tax privileges that other firms, including many domestic firms with limited or no export earnings, do not enjoy. That is on top of other tax incentives sometimes provided to large transnational corporations to entice them to locate in Mexico (Cypher and Delgado Wise, 2010, p. 124).

There is a legitimate concern that eschewing the *maquiladora* model might make Mexico less competitive in certain industries. However, Table 4.1 shows that some industries are both trade intensive and offshoring intensive. The coexistence of both business models within the same industries suggests that there is an alternative to the *maquiladora* model even within offshoring-intensive industrial sectors. Carrillo and Contreras (2008) provide an example of two

different models of local development in the transport equipment sector, one of which is associated with *maquiladora*-type development, while the second is more embedded in the domestic economy, though it is still deeply involved in international trade. The results in this chapter suggest that the latter model may lead to less employment volatility in the case of Mexico. As suggested above, one step towards reducing dependence on offshoring revenues would be to level the playing field by eliminating the tax privileges that *maquiladoras* enjoy.

One concern with the approach outlined above is that it might reduce employment in the *maquiladora* industry, especially considering that multinational enterprises can extract tax breaks from other countries competing for low-wage jobs. However, a broader set of policy tools could be used to rebuild the domestic industrial base with the goal of gradually supplanting the *maquiladora* sector. These policies include funding applied scientific research and education, protecting infant industries, regulating foreign direct investment, and strategically implementing industrial policy. Palma (2005) argues that the industrial policies of the import substitution era helped pave the way for some of the more dynamic non-*maquila* sectors in Mexico's economy. One means of strengthening domestic-based manufacturing enterprises is through judicious use of local content requirements, which stipulate that firms must source a certain percentage of their inputs domestically. Flaig and Stone (2017) find evidence that such policies could avoid the adverse GDP impacts that might be associated with the use of equivalent tariffs. Such a policy should be used in conjunction with the training and incentives needed to jumpstart homegrown suppliers of local content. Policies that facilitate technological upgrading in domestic export industries could help preserve jobs while reducing employment volatility.

Foreign direct investment and foreign trade can be made to serve the purpose of rebuilding domestic industry, but that will not happen automatically. Without effective

government policies in place to facilitate knowledge spillovers, the *maquiladora* sector is likely to remain a volatile foreign enclave in the domestic economy (Gallagher and Zarsky, 2010). In the long run, weaning the manufacturing sector off reliance on *maquila*-type production sharing arrangements will most likely require a multi-pronged industrial strategy. This chapter shows that one payoff of such a strategy would likely be lower manufacturing-sector employment volatility. It could also help fulfill the all-but-forgotten original purpose of the Border Industrialization Program: to strengthen domestic industry and catalyze national economic development (Sklair, 1993, pp. 30, 53, 141).

Chapter 5: Privatization, Liberalization, and Structural Transformations

A basic premise of this dissertation is that North American structural transformations involving transitions from independent farming to wage labor have not always been spontaneous responses to purely economic incentives. Rather, changes in the underlying institutional architecture, especially as manifested in efforts to privatize communal property, are at least partially responsible for those transitions. An example of this in the United States context is the role of the Dawes Act and subsequent land loss in compelling American Indians to disperse to distant towns and cities in search of jobs. In the case of Mexico, neoliberal institutional innovations transformed both agriculture and industry simultaneously in the 1980s and 1990s. Constitutional reforms allowed the privatization of communally owned farmland, and the liberalization of trade and investment paved the way for a proliferation of cross-border production sharing arrangements in the manufacturing sector. Both institutional changes facilitated a structural transition from an inward-oriented economy with a significant role for *ejido*-based agriculture to an economy specializing in labor-intensive stages of manufacturing production supplemented by export-oriented commercial agriculture.

The structural transformations of the United States and Mexico were very different. In the United States, much of the transition from traditional agriculture to a modern capitalist economy took place behind high tariff walls (Chang, 2003), which were reinforced by geographical isolation from European markets. In that sense, the United States experience seems roughly consistent with Matsuyama's (1992) model showing how agricultural productivity enhancements can facilitate industrialization and economic growth in a closed economy. However, Mexico since the mid-1980s has been a relatively open economy and its geographic

proximity to the United States contributes to a large volume of international trade. Although Mexico has increasingly relied on trans-national manufacturing, that has not led to sustained rapid economic growth (Ruiz Nápoles, 2004; Palma, 2005).

Yet, despite the obvious differences in the characteristics and outcomes of industrialization in Mexico versus the United States, there are remarkable similarities in the patterns of communal property privatization and Indigenous dispossession in the two countries. Both the Dawes Act and the Lerdo Law aimed to privatize Indigenous communal property, both led to massive land loss, and both triggered efforts to reverse the effects of privatization and land loss by reconstituting communal property. Furthermore, both the Dawes Act and the Lerdo Law resulted in structural transitions from self-employment to wage labor for a substantial portion of the populations affected by those laws. While former independent producers often remained employed in agriculture, they were nonetheless thrust into labor markets as wage workers, which represents a significant shift in the structure of both countries' agrarian economies.

In discussing the decision of independent farmers to sell their land and become wage laborers it is often assumed that such decisions, ostensibly free of compulsion, necessarily improve the economic welfare of the decision-maker. However, framing the decision in this way neglects the ways in which institutional change can alter the available fallback options. In particular, the Dawes Act may have reduced the value of choosing to farm by eliminating communal grazing rights and undermining tribal support networks (Carlson, 1981, pp. 89-92). Under that law, the relevant alternative to migrating usually involved living on a private allotment whereas, before the Dawes Act was implemented, the relevant alternative might have involved living on communal reservation land. Even if the decision-maker would have preferred the latter option, institutional change closed off that possibility for many people. Allotment may

have made urban migration more likely, even if it was *not* considered preferable to living on rural, communally owned land. The results in Chapter 2 largely corroborate that view. The extent to which an individual had been exposed to the effects of allotment was positively related to the probability that the individual would migrate by 1930. This suggests that allotment itself shifted the balance of costs and benefits in favor of migration.

Chapter 2 thus adds to the literature showing that the causes of outmigration from rural areas include assignment of individual titles to communal property (Valsecchi, 2014; de Janvry et al., 2015) and termination of programs that create communal property (Sanderson, 1984). However, the privatization of communal property also affects other outcomes, beyond migration. Chapter 3 examines the impact on income inequality in the context of the 1992 *ejido* reforms in Mexico. The main finding is that land sales to non-*ejido*-members and relative decreases in *ejido* membership exerted upward pressure on income inequality in Mexican municipalities between 1990 and 2010. The small sizes of the estimated effects are interesting in light of previous research on the consequences of the 1992 reforms for agricultural investment. Dower and Pfutze (2013) find that the reforms had no discernible effect on the use of credit, chemical fertilizers, or improved seeds. They also find, at best, a weak effect on the use of irrigation systems. Overall, the reforms generally had little or no impact on investment and access to credit. Given those outcomes, plus the fact that the reforms did not result in radical land tenure changes for most *ejidos* (Romero, 2015), it is likely that any efficiency gains from the reforms were negligible. In this light, it is perhaps not surprising that increases in inequality were likewise small.

Although Mexico's 1992 agrarian counter-reforms have only had a modest impact on income inequality, the historical precedents of the Dawes Act, the Lerdo Law, and their respective consequences still serve as a cautionary tale regarding the potentially devastating

effects of privatizing communal property. Commissioner of Indian Affairs John Collier noted that the allotment policy in the United States had left whole tribes without a land base and "had thrown more than a hundred thousand Indians virtually into the bread-line" (quoted in Black, 2015, p. 142). The consequences of privatizing communal property were even more severe in nineteenth-century Mexico, where land concentration reached unprecedented proportions. By the eve of the Mexican Revolution, around 87% of rural land belonged to *hacienda* owners, who comprised 0.2% of the rural population (Assies, 2008, p. 39). Andrés Molina Enríquez, an influential contemporary observer of agrarian issues, traced the origins of extreme land inequality to the Lerdo Law: "The result of the allotment (*repartición*) of indigenous village lands was that the indigenous people lost said lands" (1909, p. 98). The fact that nineteenth-century efforts to privatize communal property in both Mexico and the United States resulted in massive land loss raises questions regarding the social value of "complete" property rights, including the right to forfeit ownership, as opposed to inalienable communal property rights.

The privatization of communal property in Mexico has been much more limited in scope during the neoliberal era, as compared to the liberal era. However, the neoliberal era is also associated with the collapse of peasant agriculture and the increasing specialization of the national economy in labor-intensive manufactured goods (Otero, 2011; Cypher and Wise, 2010). Neoliberal institutional changes, in the form of both agrarian counter-reforms and the liberalization of trade and investment, have set the parameters for the continuing transition from independent farming to wage labor by transforming agriculture and industry simultaneously. The focus of government agrarian policy shifted from favoring small-scale independent producers (mainly *ejidatarios*) to favoring large-scale commercial agriculture employing wage labor. In parallel fashion, government industrial policy shifted from promoting import

substitution to overseeing Mexico's insertion into global supply chains by facilitating cross-border production sharing and offshoring.

Chapter 4 shows that employment in the offshoring sector concentrated in Mexico's northern border cities is subject to boom-and-bust cycles. This finding contributes to research on the industrial impacts of Mexico's neoliberal institutional reforms, especially the liberalization of trade and investment that began in the 1980s. The main objective of the 1994 North American Free Trade Agreement, with respect to Mexico, was arguably the promotion of foreign investment, especially in the *maquiladora* sector (Cypher and Delgado Wise, 2010, pp. 56, 67, 77). While the *maquiladora* sector grew rapidly in the 1980s and 1990s, in large part due to the neoliberal reforms, that pattern was reversed once China joined the World Trade Organization in 2001 (ibid., 2010, pp. 79-84). This illustrates one of the dangers inherent in betting on foreign direct investment as an engine of national economic growth. Low unit labor costs may attract investment and jobs, but when other countries offer even lower unit labor costs and provide an attractive investment climate, those jobs are likely to vanish. This occurred in Mexico's fledgling information technology sector in the 2000s (Gallagher and Zarsky, 2007, pp. 133-138), and in many other sectors. Competition between countries to offer the lowest wages seems to be one of the main factors driving the observed high volatility of offshoring employment in Mexico.

The findings in Chapter 4 tie in with the argument of Cypher and Delgado Wise (2010, p. 9) that Mexico's *maquiladora* sector functions as a conduit by which Mexico indirectly exports low-wage labor. Given that Mexico is competing with many countries for low-wage jobs, there is little reason to expect that promoting the *maquiladora* sector will, by itself, lead to a sustainably high rate of employment growth in the long run. Beyond that, Cypher and Delgado Wise also argue that a relatively slow rate of growth in formal-sector employment contributes to

the "direct exportation" of labor in the form of international migration (ibid., pp. 137, 140). They contend that outmigration is a consequence of the failure of Mexico's neoliberal reforms to generate adequate domestic employment opportunities. In addition to not generating enough new jobs, Chapter 4 shows that the offshoring sector also exhibits large fluctuations in employment. As was the case in the agrarian sector, neoliberal reforms have transformed Mexico's manufacturing sector in ways that most likely increase outmigration. There is also an interesting parallel between Mexican migration to the United States in the aftermath of the neoliberal reforms of the 1980s and 1990s and American Indian internal migration in the wake of the privatization of communal property. In both cases, institutional changes raised the cost, or reduced the benefit, of remaining in the same location to the point that migration seemed, to some, the best alternative.

In summary, structural transformations in North America from the nineteenth century to the neoliberal era have been preceded and shaped in various ways by profound institutional changes. American Indian migration from reservations to cities and the occupational shift from self-employment to wage work were not entirely spontaneous but driven, at least initially, by the disastrous policy of allotment. Likewise, during the neoliberal era in Mexico, important economic outcomes, from income inequality to employment volatility, are partly the product of deep institutional changes including the privatization of communal property and the liberalization of trade and investment. Those institutional changes undermined peasant agriculture and spurred the growth of the *maquiladora* sector, which represent two faces of a profound structural transformation in Mexico since the 1980s.

Finally, it is important to highlight that, while some benefited from North America's structural transformations, many others did not. In the case of Mexico, many individuals

experienced reduced job security due to greater employment volatility and others were adversely affected by shifts in the distribution of income. Similarly, the structural transformations wrought by the Dawes Act did not generally lead to improved living conditions for American Indians in the United States. Urban migration in the wake of dispossession occurred under conditions of imposed economic duress and had, at best, ambiguous impacts on the wellbeing of migrants. Future research might consider why the institutions that were believed by many to be basic preconditions for economic development yielded such disappointing results.

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Appendix A: Interpolation Methodology for Newly Formed Municipalities

To identify the sources of land for new municipalities, the following document was used to the extent possible: *Cambios en la División Municipal del País* (Ibarra & Torres, 1998). Various forms of online documentation were used for later years. The information available from these sources was cross-checked by searching for the names of the same localities (sub-municipal regions) in both the 1990 and 2010 census records to verify that the municipalities containing those localities in 2010 were, in fact, derived from the 1990 municipalities that had been identified by Internet research. While the names of localities are fairly consistent from 1990 through 2010 for larger towns, the names and spellings of smaller localities (some of which have only one or two households) vary considerably from one decennial census to the next. Also, similar to municipalities, there are new localities with each census and some cease to exist. This inconsistency across time limits the usefulness of census data on localities, which are therefore only used in a small number of cases when no other source of information is available to interpolate the data.

In cases where one or more municipalities was carved out of a single municipality, data from the next available census (either 2000 or 2010) are used to estimate each municipality's share of the population of the original, larger municipality. The same percentage shares are assumed to apply in 1990, so those percentages are used to interpolate the 1990 census data. In the 8 cases where a single municipality was created by combining pieces of two or more other municipalities, that approach will not work without knowing the percentage contributions of each of the original municipalities to the new municipality. Those percentage contributions are estimated using census data on locality-level population for the next available census. For

example, if municipalities A and B donated land to municipality C in 1997, locality data from the 1990 census were used to determine which localities that were in C in 2000 were part of A in 1990. Then the 2000 and 2010 population figures for municipality A and the part of C that formerly belonged to A are used to estimate what fraction of A ended up in C. This roundabout procedure is necessary because not all localities can be matched across census years.

For tabulations of rural population, the rural population in the next census year was used instead of total population. This modification is necessary because some rural municipalities broke off from largely urban municipalities, so using fractions of total population (rather than rural population) would yield misleading interpolations. In the case of the small subset of municipalities that were formed by joining parts of more than one other municipality, the same population shares described above for total population were used for rural population. That is because the locality level data do not provide enough detail to accurately estimate rural vs. urban subpopulations for segments of old municipalities that became new municipalities after 1990, considering problems in linking locality names across censuses (and considering that this problem is more severe for smaller localities, which might tend to bias the interpolations in the sense of overestimating urban shares). In any case, the exact method used for this very small subset of municipalities is not as important for the rural data, which are used to form dummy variables (rural = 1 if rural_percent > x%). If the dummy variable is the same regardless of the exact value of rural_percent, then small errors in interpolations shouldn't matter, and that does seem to be the case for all municipalities, at least in 2000 and 2010.

A slightly different procedure is used for the data from the Ejido Census (which is separate from the census of population). As with rural population, the breakdown of sub-municipal regions by total population is not likely to correspond to the breakdown by *ejido*

population (which tends to be heavily concentrated in rural areas). Applying population proportions from the regular census to *ejido* data might lead to skewed interpolations. The procedure used to interpolate the *ejido* data is very similar to that described above, substituting *ejido* population shares for total population shares. The only difference in the two methodologies applies exclusively to the 8 previously mentioned municipalities that were carved out of more than one pre-existing municipality. In those cases, an effort was made to identify which *ejidos* in the new municipality had originally belonged to the parent municipalities by comparing online data on individual *ejidos* from the National Agrarian Registry (RAN) with data on individual *ejidos* in supplementary pdf files published with the 1991 Ejido Census (the numbers in this supplement are for the population living in *ejidos*, which is not exactly the same thing as *ejido* membership, so again these interpolations are estimates). Unfortunately, this type of supplementary data was not published with the 2007 Ejido Census, limiting the possibility of comparing data on individual *ejidos* over time.

Appendix B: Time Series Analysis

In this section, an effort is made to identify the specific mechanisms by which offshoring might affect employment volatility. The empirical methodology described in chapter 4 rules out certain potential explanations for the relationships observed in tables 4.5-4.8. Di Giovanni and Levchenko (2009) note that trade may affect overall volatility by increasing the economy's specialization in particular industries. The industry-level analysis controls for this channel through which trade or offshoring might influence overall employment volatility. Because industries are the unit of analysis, increased specialization in particular industries could not explain the observed positive coefficients on offshoring intensity. However, that leaves open a number of other possible channels by which offshoring-related trade might affect employment volatility.

In most of the regressions, offshoring has a positive effect on employment volatility. Two broad explanations for this effect have been suggested. First, Rodrik (1997) argues that employment in offshoring sectors may be especially sensitive to domestic wage changes, i.e., the wage elasticity of labor demand is higher in those sectors. Second, Bergin, Feenstra, and Hanson, (2011) argue that wages in rich countries are procyclical. During economic expansions wages rise, causing firms to offshore more production to comparatively cheaper locations (under the assumption that workers in rich and poor countries are substitutes for multinational corporations). During contractions, wage costs do not rise as quickly, so the incentive to offshore abates. This would tend to result in more volatility in Mexico's offshoring sectors than in the corresponding U.S. sectors, a pattern which appears to be empirically validated (Bergin, Feenstra, and Hanson, 2009). Both of these mechanisms hinge on the idea that firms in the

offshoring sector are more likely to take cross-border wage comparisons into consideration when making employment and plant location decisions.

Wages in Mexico and foreign countries are observed, and those data could potentially allow an evaluation of the mechanisms described by Rodrik (1997) and Bergin, Feenstra, and Hanson (2011). Data on employment levels (rather than volatility) are needed to estimate labor demand elasticities. An analysis using those data could also arguably provide a sort of robustness check for the results reported in tables 4.5-4.8. More specifically, the elasticity of employment with respect to industrial production could serve as an alternative measure of volatility. The industrial production index is a key business cycle indicator, so if employment reacts strongly to a change in this index, that would indicate that employment is highly sensitive to business cycle movements. Furthermore, as Figures 4.1 and 4.2 make clear, business cycle movements are the key source of volatility in aggregate employment. Therefore, if employment in offshoring-oriented industries is especially responsive to changes in the industrial production index, that is a good indication of greater employment volatility in that sector. Estimation of labor demand equations including both wages and the industrial production index would help evaluate the various factors contributing to the offshoring sector's higher overall employment volatility.

Because this alternate approach relies on measuring the responsiveness of employment to wage fluctuations over time and the co-movement of employment with a business cycle indicator, a time series approach is appropriate. The question is how to distinguish the effects of business cycles and wages on employment separately for offshoring industries versus non-offshoring industries. The general approach taken is to split the aggregate employment time series into two series based on each 6-digit NAICS industry's offshoring intensity (defined as

foreign *maquila* revenue as a share of total revenue). Industries with above-average offshoring intensity are denoted offshoring sectors, whereas industries with below-average offshoring intensity are called non-offshoring sectors. The exercise was repeated using two different measures of offshoring intensity: foreign *maquila* revenue per worker and foreign *maquila* revenue divided by the sum of total *maquila* revenue and sales. The results are similar regardless of which measure is used.

The basic theoretical framework comes from the competitive firm's standard profit maximization problem, which involves profit, π, output, Y, output prices, p, a productivity factor, A, capital, K, labor, L, wages, w, and the rental rate of capital, r. Assuming that manufacturing firms in Mexico operate in a competitive market and share a Cobb-Douglas production function with capital and labor coefficients $0 < \alpha < 1$ and $0 < \beta < 1$, respectively, and $\alpha + \beta = 1$, equation (B.1) provides an expression for output.

$$Y = AK^{\alpha}L^{\beta} \tag{B.1}$$

Setting up the profit function and taking derivatives with respect to L and K gives the following.

$$\pi = pAK^{\alpha}L^{\beta} - wL - rK$$

$$\frac{\partial \pi}{\partial L} = \beta pAK^{\alpha}L^{\beta-1} - w = 0 \tag{B.2}$$

$$\frac{\partial \pi}{\partial K} = \alpha pAK^{\alpha-1}L^{\beta} - r = 0 \tag{B.3}$$

From (B.3),

$$L^{\beta} = \frac{r}{\alpha pAK^{\alpha-1}} = \frac{rK}{\alpha pAK^{\alpha}}$$

and from (B.2),

$$L^{\beta-1} = \frac{w}{\beta pAK^{\alpha}} \;\Rightarrow\; L^{\beta} = \frac{wL}{\beta pAK^{\alpha}} \;\Rightarrow\; \frac{rK}{\alpha pAK^{\alpha}} = \frac{wL}{\beta pAK^{\alpha}} \;\Rightarrow\; \frac{rK}{\alpha} = \frac{wL}{\beta} \;\Rightarrow\; K = \frac{w}{r}\left(\frac{\alpha L}{\beta}\right)$$

which can be plugged back into (B.1) to yield the following.

$$Y = A\left(\frac{w}{r}\left(\frac{\alpha L}{\beta}\right)\right)^{\alpha} L^{\beta} = A\left(\frac{w}{r}\left(\frac{\alpha}{\beta}\right)\right)^{\alpha} L^{\alpha+\beta}$$

Taking natural logarithms of that equation gives the following.

$$\ln Y = \ln A + \alpha\left(\ln\left(\frac{\alpha}{\beta}\right) + \ln w - \ln r\right) + (\alpha+\beta)\ln L \;\Rightarrow$$

$$(\alpha+\beta)\ln L = \ln Y - \ln A - \alpha\left(\ln\left(\frac{\alpha}{\beta}\right) + \ln w - \ln r\right) \;\Rightarrow$$

$$\ln L = -\frac{1}{(\alpha+\beta)}\left[\ln A + \alpha\ln\left(\frac{\alpha}{\beta}\right)\right] + \frac{1}{(\alpha+\beta)}\ln Y - \frac{\alpha}{(\alpha+\beta)}\ln w + \frac{\alpha}{(\alpha+\beta)}\ln r$$

This can then be simplified to regression equation (B.4), which includes the error term, ε_t.

$$\ln L_t = \gamma_0 + \gamma_1 \ln Y_t + \gamma_2 \ln w_t + \gamma_3 \ln r_t + \varepsilon_t \qquad \text{(B.4)}$$

The following hypotheses follow directly from the solution to the firms' profit maximization problem: $\gamma_1 > 0,\ \gamma_2 < 0,\ \gamma_3 > 0$. This specification is then augmented by adding the real exchange rate, *rexr* (Mollick, 2009) and the mean U.S. manufacturing wage (w^*), which could be considered the price of a substitute for Mexican manufacturing labor in sectors with high degrees of offshoring. Equation (B.5) shows the basic form of the regression equation, which is further modified as described subsequently.

$$\ln L_t = \alpha_0 + \alpha_1 \ln Y_t + \alpha_2 \ln w_t + \alpha_3 \ln r_t + \alpha_4 \ln w_t^* + \alpha_5 \ln rexr_t + \omega_t \qquad \text{(B.5)}$$

If the line of argument in Bergin, Feenstra, and Hanson (2011) holds true, then $\alpha_4 > 0$, implying that U.S. and Mexican workers are substitutes. The expected sign of α_5 is ambiguous. Equation (B.5) is estimated for offshoring-oriented industries only, whereas equation (B.6) is estimated for non-offshoring industries. The variables that are specific to non-offshoring industries in the version of equation (B.6) that is actually estimated are designated using a prime symbol.

$$\ln L_t' = \beta_0 + \beta_1 \ln Y_t + \beta_2 \ln w_t' + \beta_3 \ln r_t + \beta_4 \ln w_t^* + \beta_5 \ln rexr_t + \xi_t \qquad \text{(B.6)}$$

Comparing estimates for (B.5) and (B.6) will help determine whether labor demand elasticities are different in the offshoring sector, as compared to the non-offshoring sector.

The regressions are estimated using monthly-frequency data over the 2007-2018 period. Data on 240 6-digit NAICS manufacturing subsectors are utilized in creating the time series for offshoring sectors and non-offshoring sectors (two NAICS sectors were merged in the 2013-2020 surveys, which is why the total number of sectors was only 239 in the full 2007-2020 sample). The regression results below are exclusively for blue-collar workers in order to control for the fact that blue-collar workers (1) are disproportionately concentrated in the offshoring sector and (2) tend to experience greater employment volatility (Kaplan, Lederman, and Robertson, 2012). Consequently, the measure of U.S. manufacturing wages used is for production workers only.

The dependent variable in this analysis is direct employment, which excludes subcontracted employment. Although the preceding volatility analysis did include subcontracted employment, that is problematic when estimating a labor demand equation because data on the wages of subcontracted workers are not available for the 2007 to 2018 sample. Thus, even though the method for identifying offshoring-intensive sectors is identical to that used in creating Figures 4.1 and 4.2, the employment numbers are not directly comparable because Figures 4.1 and 4.2 were for total employment, whereas the analysis in this appendix excludes subcontracted workers. Also, the 2013-2020 series is not used here because the 2020 recession resulted in a very large increase in hourly wages (computed as total wages paid divided by hours worked) in March and April of that year, which is likely spurious and due to workers staying home because of pandemic-related plant closures while continuing to be paid.

Y is measured by Mexico's industrial production index, which is employed as an indicator of business cycles and denoted *mxipi*. Blue-collar wages are calculated by dividing total wages paid to those workers over their total hours worked and then deflating the series using Mexico's CPI. Several possible proxies for *r* were considered, including the yields on 28-day U.S. treasury certificates and 364-day Mexican treasury bills (CETES). However, the measure ultimately selected for the final regression specifications shown below is the yield on 28-day CETES stated in real terms. U.S. manufacturing-sector wages are measured by real average hourly earnings of production and nonsupervisory employees, expressed in Mexican pesos (so that all the wage variables are measured in the same currency). The central bank of Mexico's multilateral real exchange rate index is used to measure *rexr*, which is calculated with respect to 111 other currencies and adjusted for inflation using consumer prices. The measures of both *rexr* and *r* are similar to those used by Mollick (2009) in a study of *maquiladora* employment.

Summary statistics on employment and wages are shown in Table B.1. Although the regression analysis is only conducted for blue-collar workers, descriptive statistics are also reported for white-collar workers to highlight some of the key differences between the offshoring sector and the non-offshoring sector. One important pattern in Table B.1, which has already been noted elsewhere, is that blue-collar workers constitute a much larger fraction of offshoring-oriented manufacturing employment versus non-offshoring employment, 88% versus 76%, respectively, on average over the 2007-2018 time period. It is also interesting to note that blue-collar wages are slightly lower in the offshoring sector than in the non-offshoring sector, whereas, for white-collar wages, the opposite is true. Put another way, the ratio of white-collar wages to blue-collar wages is considerably higher in the offshoring sector than in the non-

offshoring sector, a ratio of 3.4 versus a ratio of 2.4, respectively, on average over the sample period. This suggests that there is greater wage inequality in the offshoring sector, which is interesting in light of previous research suggesting that trade liberalization in Mexico increased wage inequality (Feliciano, 2001).

Table B.1 Summary Statistics

Variable	Units	Offshoring Oriented	Non-Offshoring
Blue-Collar Workers	Direct Employees	1,100,381	1,085,409
White-Collar Workers	Direct Employees	155,530	337,172
Blue-Collar Wage	2018 Pesos Per Hour	40.35	43.72
White-Collar Wage	2018 Pesos Per Hour	137.58	106.83

Note: The figures reported are mean values calculated over the 2007-2018 period for direct employment (i.e., excluding subcontracted workers).

Dickey-Fuller tests indicate that several of the variables used in this analysis have unit roots in levels. However, none of the first-differences of those variables have unit roots. Therefore, the data are first-differenced prior to estimation to ensure stationarity. The first-difference operator is denoted by Δ. A lag order of two minimizes the Schwarz Bayesian Information Criterion (BIC) for the offshoring sector data. For the non-offshoring sector, a lag order of one is selected by the BIC. However, in both cases, most of the explanatory variables are only contemporaneously correlated with the dependent variable, as indicated by *t*-statistics on the individual coefficients. For the own wage, statistically significant impacts are observed both contemporaneously and at a one-period lag. Therefore, one period lags are included for the own wage, but no lags are included for the other explanatory variables. Two lags of the dependent variable are included. *Q*-statistics indicate that serial correlation is not problematic in any of the

regressions. Equations (B.7) and (B.8) are the variants of (B.5) and (B.6), respectively, which will be estimated.

$$\boldsymbol{Offshoring\ Sector}: \Delta \ln L_t = a_0 + a_1 \Delta \ln L_{t-1} + a_2 \Delta \ln L_{t-2} + a_3 \Delta \ln Y_t + a_4 \Delta \ln w_t + a_5 \Delta \ln w_{t-1} + a_6 \Delta \ln r_t + a_7 \Delta \ln w_t^* + a_8 \Delta \ln rexr_t + e_t \quad \text{(B.7)}$$

$$\boldsymbol{NonOffshoring\ Sector}: \Delta \ln L'_t = b_0 + b_1 \Delta \ln L'_{t-1} + b_2 \Delta \ln L'_{t-2} + b_3 \Delta \ln Y_t + b_4 \Delta \ln w'_t + b_5 \Delta \ln w'_{t-1} + b_6 \Delta \ln r_t + b_7 \Delta \ln w_t^* + b_8 \Delta \ln rexr_t + v_t \quad \text{(B.8)}$$

The main reason for running these two separate regressions is to compare wage elasticities for the offshoring and non-offshoring sectors. If U.S. and Mexican factory workers are substitutes in the offshoring sector, as suggested by Bergin, Feenstra, and Hanson (2011) and others, then $a_7 > 0$. Since there is no reason to suppose that U.S. wages would directly affect employment levels in Mexico's non-offshoring sector, one would expect $b_7 = 0$. Furthermore, if the own-wage elasticity of labor demand is higher in the offshoring sector, as argued by Rodrik (1997), then $|a_4| > |b_4|$ and $|a_5| > |b_5|$. Finally, given that volatility cannot be directly computed at a monthly frequency, the elasticity of labor demand with respect to industrial production will serve as a proxy measure of volatility. The industrial production index (*Y*) is a key business cycle indicator and business cycles are the main source of aggregate manufacturing employment volatility in Mexico, so the responsiveness of manufacturing employment to variation in industrial production can help measure volatility. The hypothesis that employment volatility is greater in offshoring industries can then be expressed as $a_3 > b_3$. Controlling for *w, w',* and *w** effectively holds constant wage-related factors that could help explain the higher volatility of offshoring industries. So, if $a_3 > b_3$, even after controlling for *w, w',* and *w**, this would suggest that additional factors, besides domestic and foreign wage effects, are also behind the greater volatility of the offshoring sector.

Regression results are reported in Table B.2. The baseline model corresponds to equations (B.7) and (B.8). Consistent with the argument of Rodrik (1997), offshoring-sector employment is indeed much more sensitive to domestic wage changes than non-offshoring employment. The estimated wage elasticities are about four times larger in absolute value in the offshoring sector than in the non-offshoring sector. The effect of the interest rate on 28-day CETES, as a proxy for *r*, is positive as anticipated. Mexican blue-collar manufacturing employment in the offshoring sector appears to respond to changes in the wages of U.S. manufacturing production workers, although that effect is only statistically significant at the 10% level. As predicted, this cross-wage effect is absent from the equation for the non-offshoring sector. Furthermore, the sign of the U.S. wage coefficient in the offshoring equation is negative, suggesting that production workers in Mexico's offshoring sector are complements, rather than substitutes, for U.S. manufacturing-sector production workers (Robertson, 2007; Kaplan, Lederman, and Robertson, 2012). Coefficients on the real exchange rate index are not statistically significant in any regression.

The results in the baseline model generally support the idea that the elasticity of employment with respect to industrial production (*mxipi*) is higher in the offshoring-intensive sector, even after controlling for *w, w',* and *w**, though the difference is not very large. This at least leaves open the possibility that other factors, besides wage dynamics, help explain the observed volatility differences. However, the line of reasoning above suggests that the differential between the offshoring-sector coefficient on *mxipi* and the non-offshoring-sector coefficient, in the baseline models, only captures the "unexplained" component of volatility differences across the two sectors. If that is true, then the offshoring-sector *mxipi* coefficient should increase in size when the "explained" components (i.e. those corresponding to *w*, *w'*, and

Table B.2 Results of regressions on first-differenced time series data, blue-collar workers

	Baseline Models		Restricted Models	
	Offshoring Oriented	Non-Offshoring	Offshoring Oriented	Non-Offshoring
$\Delta(\ln employment)_{t-1}$	0.26142*** (0.09679)	0.17089* (0.09178)	0.32222*** (0.09616)	0.15601* (0.09354)
$\Delta(\ln employment)_{t-2}$	0.40142*** (0.08582)	-0.01766 (0.08328)	0.24626*** (0.08505)	-0.06762 (0.08118)
$\Delta(\ln mxipi)_t$	0.05997*** (0.01602)	0.04165*** (0.01335)	0.08592*** (0.01762)	0.04293*** (0.01159)
$\Delta(\ln own\ wage)_t$	-0.04328*** (0.00714)	-0.00878** (0.00342)		
$\Delta(\ln own\ wage)_{t-1}$	-0.03314*** (0.00897)	-0.00825*** (0.00282)		
$\Delta(\ln interest\ rate)_t$	0.01054** 0.00504	0.01451*** 0.00393	0.00653 (0.00648)	0.01345*** (0.00460)
$\Delta(\ln U.S.\ wage)_t$	-0.05522* (0.03116)	-0.00235 (0.02670)		
$\Delta(\ln rexr)_t$	0.02767 (0.03562)	-0.00611 (0.02673)	-0.03259 (0.02281)	-0.01054 (0.01935)
Constant	0.00091 (0.00065)	-0.00002 (0.00037)	0.00079 (0.00073)	-0.00005 (0.00038)
R^2	0.5384	0.2378	0.3518	0.1749
F-statistic	16.45***	7.41***	11.16***	6.47***
Q-statistic	2.2382	1.0504	2.8151	1.2807
Prob(*Q*)	0.6920	0.9021	0.5892	0.8646

Notes: Robust standard errors are in parentheses. * $p < .10$, ** $p < .05$, *** $p < .01$

*w**) are eliminated from the regression equations. This is tested by running restricted models that exclude all of the wage measures. The *mxipi* coefficient differential between the offshoring

and non-offshoring sectors does indeed increase, from 0.0183 to 0.0430, when the wage variables are excluded. This suggests that differences across sectors in own- and cross-wage elasticities of labor demand are potentially accounting for a large percentage of the employment volatility differential between the offshoring and non-offshoring sectors. That aligns with the arguments of Rodrik (1997) and Bergin, Feenstra, and Hanson (2011). In particular, it suggests that the offshoring sector's sensitivity to domestic and foreign wage variation can help explain its greater employment volatility.

The main result from Table B.2, pertaining to the study of offshoring and volatility, is that the wage elasticity of labor demand is higher in the offshoring sector than in the non-offshoring sector. This lends some support to the idea that offshoring increases employment volatility by augmenting the substitutability of workers in different countries (Rodrik, 1997). However, the results in Table B.2 also provide (weak) evidence that workers in the U.S. and Mexico may be complements in production, rather than substitutes. One way of reconciling this seemingly contradictory evidence is that Mexican workers may be complementary with respect to U.S. manufacturing workers but are still substitutable with respect to workers in other developing countries (Smith, 2016, p. 84). A steady rise in Mexican wages, with respect to wages in other developing countries, could lead to a collapse of employment in the offshoring sector, as indeed occurred when many *maquiladoras* relocated to China in the early 2000's. The vulnerability of *maquiladora* jobs to competition from other developing countries might help explain why the offshoring sector has a higher wage elasticity of labor demand and greater employment volatility, compared to the non-offshoring sector.

Due to cross-border supply chain and production sharing linkages, U.S. and Mexican workers may truly be complements (responsible for capital-intensive and labor-intensive stages

of production, respectively). If workers in the United States and Mexico are indeed complements, that could also lend credence to the view that *maquiladoras* are one channel by which U.S. recessions are imported to Mexico, as employment levels in cross-border "twin" plants move in tandem (Mejía, Gutiérrez, and Pérez, 2006). Such complementarity could help account for the growing cross-border business cycle synchronization that has been documented in previous research (Torres and Vela, 2003; Chiquiar and Ramos-Francia, 2005). However, the evidence in Table B.2 for a linkage between U.S. wages and offshoring-sector employment is rather weak, and its effect on employment volatility is not entirely clear. Although this exercise suggests some possible mechanisms by which offshoring trade may increase employment volatility in Mexico, further research is needed to fully assess whether those mechanisms exist and, if so, how they operate.

Appendix C: Manufacturing Surveys

The first iterations of Mexico's annual and monthly manufacturing surveys were created in 1963 and 1964, respectively. The first monthly series to use the survey's current name (EMIM) runs from January 2007 through February 2019. The sample was constructed to cover 240 6-digit NAICS manufacturing subsectors represented by 11,406 establishments. The sample size is significantly larger than those of EMIM's antecedents, which include the 1994 series and 2005 series Monthly Industrial Surveys (with 6,867 and 7,238 establishments, respectively). In January 2013 a new EMIM series was initiated, replacing the 2007 NAICS codes with 2013 NAICS codes and reducing the sample size to 10,447 establishments and 239 industries (INEGI, 2019a). The analysis also employs data from the annual manufacturing survey, EAIM. The first EAIM series runs from 2009 to 2017 and uses 2007 NAICS industry definitions. The sample consists of 11,455 establishments across 240 industries. Similar to the monthly survey, a new annual series was initiated in 2013 with 10,447 establishments and 239 industries (INEGI, 2019b). Data for this analysis come from EMIM (2007-2020) and EAIM (2009-2020) because those series include *maquiladoras*, whereas previous series do not.

The monthly and annual surveys are nationwide in scope and are administered using both printed and electronic questionnaires. Surveyed establishments are selected from the population of all manufacturing establishments, which is recorded every 5 years in Mexico's Economic Censuses. The survey is designed to be representative at the 6-digit NAICS industry level. The survey design is primarily deterministic. For the large majority of industries, the sample is formed by selecting those establishments from the Economic Census that comprise the largest

shares of industrywide total revenue. A probabilistic sampling approach is used for NAICS sectors 311812, 311830, 312112, and 332320 (INEGI, 2019a; 2019b).

Appendix D: Econometric Analyses of the 2009-2010 and 2019-2020 Windows

In the regression analysis presented in tables 4.5-4.8, it was convenient to use two seven-year time windows, which together span the full 2007-2020 period. In order to gauge the sensitivity of the results to this particular way of splitting up the sample period, an alternate periodization is considered. In this alternative, only years around the troughs of the Great Recession and the Pandemic Recession are considered, namely 2009-2010 and 2019-2020. The cross-sectional and industry-time panel results are shown in tables D.1 and D.2. Annual-frequency data on NAICS sector 315991 are not available for 2019 and 2020, which reduces the number of industries in the sample by one. One notable difference, as compared to tables 4.5 and 4.6, is that the capital-labor ratio no longer exerts a positive and significant effect on employment volatility in any of the equations. Probably the most noteworthy difference from the previous tables is that the import-intensity coefficients are now uniformly positive, and they are significantly different from zero in the cross-sectional regression equations. Another difference is that some of the offshoring-intensity coefficients in the industry-time panel regression equations are negative, although they are economically and statistically indistinguishable from zero, the same as in tables 4.5 and 4.6. The cross-sectional results continue to indicate a positive and significant effect of offshoring intensity.

Table D.1 Total employment volatility equations, alternate periodization

	Cross-sectional results		Industry-time panel results	
	sdgr 09-10	*sdgr* 19-20	*sdgr*	*sdhp*
Total Growth Rate	0.02867***	0.06466***	0.03140***	0.03196***
	(0.00614)	(0.01166)	(0.00827)	(0.00686)
Ln (*Total Emp.*)	-0.08291**	-0.13118***	-0.48370***	-0.17960
	(0.03485)	(0.03294)	(0.13631)	(0.11632)
Capital-Labor Ratio	-0.02809	-0.02465	0.03523	0.00568
	(0.02562)	(0.02346)	(0.03519)	(0.04694)
Blue-Collar Percent	0.01527***	0.01253***	0.00582	0.00175
	(0.00399)	(0.00333)	(0.00656)	(0.00580)
Women Percent	-0.00313	0.00203	-0.01398	-0.00416
	(0.00274)	(0.00309)	(0.01035)	(0.00810)
Import Intensity	0.00891***	0.00707**	0.00436	0.00616
	(0.00334)	(0.00296)	(0.00553)	(0.00586)
Export Intensity	0.00787***	0.00223	-0.00062	-0.00193
	(0.00292)	(0.00231)	(0.00587)	(0.00590)
Offshoring Intensity	0.00859***	0.00563**	-0.00059	-0.00085
	(0.00208)	(0.00254)	(0.00679)	(0.00544)
2019-2020 Window			-0.36486***	-0.18652***
			(0.05739)	(0.05376)
Constant	1.09578***	1.13654***	5.87700***	2.52489**
	(0.37504)	(0.32432)	(1.11540)	(1.03617)
Observations	238	238	476	476
R-squared	0.4074	0.4192	0.4320	0.2421
F-statistic	20.529***	19.022***	16.401***	8.588***

Notes: See the notes for Table 4.5. * $p < .10$, ** $p < .05$, *** $p < .01$

Table D.2 Blue-collar employment volatility equations, alternate periodization

	Cross-sectional results		Industry-time panel results	
	sdgr 09-10	*sdgr* 19-20	*sdgr*	*sdhp*
Blue Col. Growth Rate	0.02536***	0.05595***	0.03044***	0.02946***
	(0.00538)	(0.01027)	(0.00770)	(0.00647)
Ln (*Blue Collar Emp.*)	-0.08902***	-0.14224***	-0.47174***	-0.17292
	(0.03400)	(0.03181)	(0.13523)	(0.11610)
Capital-Labor Ratio	-0.05048**	-0.04871*	-0.00196	-0.01678
	(0.02319)	(0.02716)	(0.04501)	(0.05165)
Blue-Collar Percent	0.01084**	0.00846**	0.00374	-0.00217
	(0.00431)	(0.00326)	(0.00568)	(0.00525)
Women Percent	-0.00369	0.00388	-0.01127	-0.00549
	(0.00267)	(0.00291)	(0.01002)	(0.00782)
Import Intensity	0.00867***	0.00646**	0.00481	0.00565
	(0.00325)	(0.00294)	(0.00574)	(0.00581)
Export Intensity	0.00804***	0.00285	0.00055	-0.00050
	(0.00282)	(0.00227)	(0.00615)	(0.00623)
Offshoring Intensity	0.00850***	0.00541**	0.00135	0.00009
	(0.00212)	(0.00245)	(0.00677)	(0.00540)
2019-2020 Window			-0.40334***	-0.22650***
			(0.06246)	(0.05869)
Constant	1.66532***	1.61737***	5.85447***	2.92439***
	(0.37327)	(0.31203)	(0.91074)	(0.89186)
Observations	238	238	476	476
R-squared	0.3742	0.3907	0.4328	0.2664
F-statistic	18.801***	16.009***	17.897***	10.770***

Notes: See the notes for Table 4.5. * $p < .10$, ** $p < .05$, *** $p < .01$

Table D.3 Total employment volatility equations, regional analysis and alternate periodization

	Industry-region panel results		Three-dimensional panel results	
	sdgr 09-10	*sdgr* 19-20	*sdgr*	*sdhp*
Total Growth Rate	0.02875***	0.03032***	0.02702***	0.02565***
	(0.00709)	(0.01011)	(0.00580)	(0.00412)
Ln (*Total Emp.*)	-0.10284*	-0.16518***	-0.16061***	-0.15577***
	(0.05299)	(0.04584)	(0.03756)	(0.03153)
Capital-Labor Ratio	-0.03132	0.04601	0.00283	-0.00113
	(0.04539)	(0.07769)	(0.03678)	(0.03027)
Blue-Collar Percent	0.00793	0.00233	0.00614	0.00674*
	(0.00653)	(0.00559)	(0.00422)	(0.00391)
Women Percent	0.00385	0.00562	0.00184	0.00372
	(0.00626)	(0.00481)	(0.00403)	(0.00356)
Import Intensity	0.00209	0.00013	0.00176	0.00354*
	(0.00352)	(0.00314)	(0.00201)	(0.00210)
Export Intensity	0.00696**	0.00190	0.00350*	0.00136
	(0.00324)	(0.00296)	(0.00208)	(0.00180)
Offshoring Intensity	0.00516**	0.00508**	0.00526***	0.00442***
	(0.00207)	(0.00224)	(0.00166)	(0.00154)
Border	0.07163	0.04035	0.04670	0.10808*
	(0.09412)	(0.08397)	(0.06821)	(0.05907)
2019-2020 Window			-0.43852***	-0.21843***
			(0.04502)	(0.03975)
Constant	1.80970**	2.34257***	2.54035***	1.66050***
	(0.69993)	(0.55832)	(0.44697)	(0.40718)
Observations	338	338	676	676
R-squared	0.3292	0.2796	0.3956	0.3382
F-statistic	10.418***	8.336***	32.225***	29.917***

Notes: See the notes for Table 4.5. * $p < .10$, ** $p < .05$, *** $p < .01$

Table D.4 Blue-collar employment volatility equations, regional analysis and alternate periodization

	Industry-region panel results		Three-dimensional panel results	
	sdgr 09-10	*sdgr* 19-20	*sdgr*	*sdhp*
Blue Col. Growth Rate	0.02833***	0.03301***	0.02654***	0.02478***
	(0.00658)	(0.01035)	(0.00528)	(0.00399)
Ln (*Blue Collar Emp.*)	-0.10405**	-0.16165***	-0.15669***	-0.16144***
	(0.04629)	(0.04490)	(0.03553)	(0.03248)
Capital-Labor Ratio	-0.06331*	-0.02430	-0.05048*	-0.04049
	(0.03771)	(0.05178)	(0.02856)	(0.02515)
Blue-Collar Percent	-0.00522	-0.00383	-0.00327	-0.00042
	(0.00686)	(0.00545)	(0.00440)	(0.00431)
Women Percent	0.00375	0.00325	0.00036	0.00195
	(0.00594)	(0.00453)	(0.00428)	(0.00365)
Import Intensity	0.00059	-0.00037	0.00086	0.00241
	(0.00317)	(0.00302)	(0.00195)	(0.00214)
Export Intensity	0.00972***	0.00370	0.00561**	0.00313
	(0.00289)	(0.00290)	(0.00217)	(0.00201)
Offshoring Intensity	0.00682***	0.00593***	0.00655***	0.00546***
	(0.00222)	(0.00219)	(0.00172)	(0.00165)
Border	0.06436	0.05198	0.04934	0.09796*
	(0.08324)	(0.07927)	(0.06394)	(0.05874)
2019-2020 Window			-0.47506***	-0.24739***
			(0.04822)	(0.04266)
Constant	2.92137***	2.91664***	3.37218***	2.41833***
	(0.62327)	(0.51423)	(0.40879)	(0.38506)
Observations	338	338	676	676
R-squared	0.3306	0.2998	0.4093	0.3206
F-statistic	10.462***	7.775***	33.206***	26.594***

Notes: See the notes for Table 4.5. * $p < .10$, ** $p < .05$, *** $p < .01$

Tables D.3 and D.4 show the panel data regression results including a regional dimension for the 2009-2010 and 2019-2020 windows. Comparing these results with tables 4.7 and 4.8, it is noteworthy that the shares of total industry employment comprised of blue-collar workers and women are no longer significant predictors of employment volatility using a 5% significance criterion. Another interesting difference is that export intensity now exerts a statistically significant impact on the growth-based employment volatility metrics (*sdgr*) in the Great Recession time window and, for blue-collar workers, in both time windows considered jointly via three-dimensional panel analysis. The estimated effect of offshoring intensity on employment volatility is largely similar to that reported in tables 4.7 and 4.8. In the case of blue-collar employment, the offshoring-intensity parameter estimates are uniformly larger when the time window is narrowed to the years near the troughs of recessions. Three-dimensional panel results indicate that a one-percentage-point increase in offshoring intensity causes a 0.44% to 0.66% increase in employment volatility. It continues to be the case that omitting offshoring intensity from the regressions leads to larger and statistically significant estimated border effects.