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Land Titles, Credit Markets and Wealth Distributions

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Abstract

Does the existence of formal title to land and real estate matter for the distribution of wealth? This paper reviews the empirical literature on the economic impact of land and real estate administration systems across countries. This paper argues that a functioning credit market for secured credit is necessary to realize the full benefits of legal title to private real estate. This paper also reviews quantitative economic theory on wealth distribution to assess the likely impact of different land registration systems on wealth inequality. The implication of current theory is that poor land administration systems may sometimes lead to lower levels of wealth inequality than better land registration systems.

Keywords: land titles, credit markets, wealth distribution
JEL classification: E21, K11

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1 Introduction

There are substantial cross-country differences in the clarity and security of private titles to land and real estate. In addition, the substantial cross-country variation in credit market laws and regulations lead to large differences in the extent to which real estate can be used as collateral for borrowing. While these differences have motivated a substantial literature exploring their role in accounting for cross-country differences in aggregate economic outcomes, relatively little attention has been paid to their potential implications for the distribution of wealth within countries. This paper attempts to partially address this void, and asks whether and how the land administration system and credit market regulations for land and real estate matter for wealth distribution.

This is a potentially interesting question for several reasons. First, land and real estate possess several characteristics which distinguish them from other goods. In particular, land and real estate are fixed in location and often are consumed (or used in production) in bulky bundles (Galal and Razzaz 2001). In practice, this means that real estate is often purchased using collateralized financing, or is used to secure lending for other purposes. This, combined with the fact that land and real estate comprise a significant share of a typical household's portfolio suggests that changes in the ownership rights and/or the ability to use real estate as collateral could have a large impact upon household's access to credit and the distribution of wealth.

This question is also of interest since there are large differences across countries in land administration policy. One example of these differences is the large cross-country variation in the fraction of the housing stock lacking formal title, ranging from virtually zero in developed countries to over 50 per cent in sub-Saharan Africa, over 40 per cent in East Asia and roughly 25 per cent in Latin America and the Middle East (Deininger 2003). Not surprisingly, this variation has motivated substantial work on the economic implications of land titling systems. As we discuss in more detail in Section 4, this literature suggests that for most developing countries, improved land registration systems combined with credit markets reforms would likely have a positive impact on the level of productivity and GDP.[1] Partly as a result of this work, there has been renewed interest by policymakers in efforts to reform land administration policy in developing countries.

The final motivation for asking this question is that economic theory provides several mechanisms via which the land titling system and associated credit market regulations could influence wealth distribution. One such mechanism is shifts in the portfolio of assets held by households in response to variations in the extent to which real estate can

[1] In a recent attempt to popularize the role of property rights, de Soto (2000) argues that differences in land administration systems play a key role in the relative underdevelopment of poor countries compared to the West.

be used as collateral for personal loans. If legally recognized titles to land are non-existent, or if there is no legal mechanism for enforcing mortgage contracts, then real estate will have little value as collateral. This is likely to increase the down payment required from purchasers of real estate, and may make it difficult for households to access equity in their home should the need arise. Given that personal real estate (mainly residential structures) comprises between one third and half of the assets of the median household in developed countries, changes in the value of real estate as collateral could lead to large shifts in household portfolios. This provides a channel via which different land titling systems could lead to different wealth distributions.

Another important channel via which land policy could influence wealth distribution is by changing the borrowing constraints of actual and potential entrepreneurs. Given that real estate often serves as collateral for loans, limits on real estate titles or restrictions on repossessions of real estate by lenders may make it more difficult for entrepreneurs to borrow to finance their business. Indeed, this channel figures prominently in the de Soto (2000) argument that land titling systems have a large impact on GDP per capita.[2] This could have an especially large impact on the extreme tail of the wealth distribution, as entrepreneurs comprise a significant proportion of the wealthiest one percent of households in developed countries (Davies and Shorrocks 2000; Cagetti and De Nardi 2005).

The mechanisms sketched above highlight the fact that the effectiveness of land administration policy is likely to be dependent upon the extent to which real estate assets can be pledged as collateral. This is why this paper adopts a broad definition of land titles which includes both formal ownership rights to land as well as credit markets rules which facilitate the usage of real estate as collateral for borrowing. As we discuss in Section 2, land titling systems in most developed countries include both of these elements.

Evaluating the relationship between land administration systems and wealth distribution is complicated by a paucity of data on wealth distributions. As discussed in Davies and Shorrocks (2000), obtaining accurate measures of wealth distribution is difficult even for developed countries. As a result, there is little comparable cross-country data on the distribution of household wealth that could be used to help identify the effect of different land administration systems. Given the data limitations, the approach taken in this paper is to draw upon available economic theory so as to obtain a preliminary and rough overview of the qualitative and quantitative impact of different land administration systems on wealth distribution. In particular, we draw upon recent attempts to understand the relationship between durable goods and wealth distribution,

[2] In an insightful review of de Soto (2000), Woodruff (2001) points out some missing links in his arguments, and challenges some of de Soto's estimates. For the most part, this essay abstracts from the question of why these rights are not enacted and focus on the positive question of what potential impact they might have on the wealth distribution.

as well as that between entrepreneurship and wealth distribution, using dynamic, incomplete market heterogeneous agent models.

In many ways, the answer that emerges from existing theory is somewhat surprising. One might expect that the presence of limited titles to land and real estate would act to accentuate wealth inequalities. However, standard existing theory of dynamic general equilibrium models where households face uninsurable income shocks suggests that there are several forces which act in the opposite direction. Indeed, recent work suggests that improved land titling systems could increase wealth inequality by reducing the need for lower wealth households to accumulate financial assets to use as down payments or as precautionary savings. While the implications of current theory on entrepreneurship and wealth distribution is more ambiguous, improved land titling systems may also generate increased wealth inequality by providing high ability entrepreneurs with increased access to credit. Note however, that the increases in wealth inequality caused by improved land titles are not 'bad' in these theories, as households always prefer the world with better defined land titles.

Several caveats about the scope of this paper are in order. First, this paper leaves open the question of why different countries have chosen different land administration systems. Instead, this paper asks what effect varying the land title system would have on the wealth distribution. Second, this paper abstracts from the possible effect land titles might have on government policy by shifting the distribution of wealth (especially land). Finally, this paper abstracts from the issue of differential access to formal land titles and credit markets.

This paper is organized as follows. Section 2 outlines what a land titling system involves and briefly discusses the evolution of land and real estate rights and credit markets in Western countries. Section 3 briefly reviews some key facts on the role of real estate in the distribution of wealth. The literature on the impact that land administration has on the level of GDP and productivity is reviewed in Section 4. Section 5 explores the relationship between household real estate holdings and titles and wealth distribution, focusing on the impact that this has on household savings and portfolio decisions. Possible interactions between titles to durable goods, entrepreneurship and wealth distribution are discussed in the sixth section. The final section is a brief conclusion.

2 Land title systems

This section addresses two issues. The first is what we mean by a land title system. Second, we seek to provide some evidence that there are large differences across countries in land title systems. In addition, we will briefly outline the development of these rights in developed countries, with particular emphasis on North American developments.

2.1 What is a land titling system?

Before discussing the implications of different land title systems for wealth distribution, we need to define what we mean by a land titling system. As noted earlier, this paper adopts a broad view, so that a land title system encompasses all of the processes required to legally recognize, protect and record trades of real estate by private parties, as well as the legal and administrative processes required to support the efficient operation of the mortgage market.[3] The motivation for adopting this broad definition is to capture the various ways through which land rights can impact wealth distribution.

Clearly, a necessary aspect of any land titling system is some formal system of granting and recording ownership rights to specific parcels of land and real estate to different parties. In addition, there should be a well specified mechanism for resolving any disputes over the boundaries or ownership of different properties.[4] These activities are typically referred to as land administration (Deininger 2003). Moreover, these ownership rights should be freely tradeable between consenting parties. To support these trades, the titling system thus needs to be able to efficiently record the sale or transfer of property between different parties as well as provide prospective buyers with accurate information on the current ownership of land.

The process of recording ownership and sales of land is termed a land administration system. In practice, land administration systems have two components. The first is a registry that tracks land ownership and transactions. The second is a database, termed a *cadastre*, which is a public record of interests in land (Deininger 2003). This generally includes maps and other descriptions of land parcels and the identity of the owner of various legal rights to the land. In addition, most cadastres also contain information on the valuation of the land, land use as well as any buildings or structures present (Williamson 1985).

Many land titling programs have focused on the creation of a cadastre and resolving outstanding disputes over the ownerships of different properties. However, the successful working of land and real estate markets requires more than secure and well defined titles to land. Since property is typically fixed in location and is generally purchased in 'large' bundles, it serves as collateral for a substantial fraction of lending in developed countries.[5] The usage of land and real estate as collateral for borrowing,

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[3] We restrict attention to *private* land titles, and abstract from the question of how to assign wealth shares of publicly owned or communally owned rights—rights to land and real estate that are held by individual households or businesses. This is an important distinction, as property rights to real estate are often allocated to governments or to groups.

[4] This condition is not always satisfied even in developed countries. For example, in Canada there are a number of ongoing disputes over the ownership of some parcels of lands claimed by aboriginal groups as well as private or public parties.

[5] Indeed, in Canada and the USA mortgages account for roughly 70 per cent of consumer borrowing.

however, requires a set of (enforced) rules that allow potential lenders to determine not only who has existing title to a property, but also the value of any outstanding liens or other claims. Additionally, lenders must have the legal right to take possession of these assets in the event of default. The effectiveness of these foreclosure rights (in the event of a loan default) depends upon how expensive they are to use as well as how quickly they are enforced.[6]

Land titling systems in most developed countries have land administrative systems and credit market institutions that accomplish these objectives. Generally, a cadastre-type system provides accurate information on property ownership. A well specified procedure for recording the transfer of property also exists, and there is a well defined body of law which provides the basis for settling any disputes over ownership. The legal institutions required to support the credit market for real estate are also well developed. In Canada, for example, the need for accurate and accessible information on outstanding loans is handled through the Personal Property Security Act (PPSA). This act specifies where and what type of information about mortgages (and other secured loans) must be recorded, and how this information can be accessed. In particular, the PPSA requires the names and addresses of the parties, a description of the collateral and the length of the registration (Cuming et al. 2005). These records are maintained in a single, centralized computer database at the provincial level which provides a low cost way of checking for existing liens on real estate. In addition, there is a well defined set of (enforced) procedures for the seizure of real estate in the event of default.

While many developed countries have implemented (broadly) similar rules, the same cannot be said for many developing countries. In many developing countries, substantial fractions of the land and real estate lack full legal title which can be sold (Deininger 2003). In addition, many countries lack public credit registries, or have limited or unenforceable foreclosure proceedings. One potential explanation for these differences is that the benefits of public credit registries and property rights are greater in more developed economies. If this were true, then these differences in land and real estate markets may simply reflect the lower level of real GDP per capita in developing countries compared to developed countries. To explore this possibility, we briefly document the development of land title system in developed countries. Combining this with historical data on real GDP per capita, this gives us a quick check of whether developing country land markets are actually that different from developed countries such as Canada at a comparable stage in their economic development.

[6] Several papers have found that variations in foreclosure rules across states within a country matter. Pence (2003) finds that USA states with laws that increase the cost and time involved in foreclosures have mortgages 4 to 6 per cent smaller than states with more lender friendly rules. Jappelli et al. (2005) look at data on court enforcement of financial contracts and lending across Italian regions, and find that these differences in court enforcement significantly affect households' ability to borrow.

2.2 Historical development of real estate markets

Property rights to land can take various forms. Historically, many property rights were of a communal or group nature, whereby a group of households had joint claims over the usage of certain parcels of land. What is of particular interest here, however, is the development of registration systems and changes in credit market support systems for land and real estate markets in developed nations over the past 200 years. Particular attention is paid to the Canadian experience, since it is reasonably representative of developed countries.

Standard economic theory suggests that the emergence and development of property rights should be driven by changes in the benefits and the costs of creating and enforcing them (Demsetz 1967). As Deininger and Feder (2001: 288-31) note, establishing and enforcing property rights to land and real estate is costly as plots of land must be measured, accurate records of land titles maintained and disputes over land ownership must be settled. Deininger (2003) argues that the emergence of individual property rights in land can be viewed as an institutional response to higher land values. The general idea is that an increase in the relative scarcity of land creates an incentive for the creation of rental markets for land so as to allocate scarce productive resources to their most productive usages. This in turns requires the recognition of individual rights to specific sections of land.

The evolution of these legal rights in developed nations appears to be roughly in accordance with theory. While there are records of land ownership since at least ancient Egypt, the movement towards systematic cadastre-based land registration systems took place in continental Europe in the early 1800s (Williamson 1985). Many of these systems in continental Europe evolved from land tax systems into a system more focused on recording who possessed the title to different parcels of land. The common law countries (Australia, Canada, New Zealand, UK, USA) operate variations on the cadastral system of continental Europe. Unlike many continental countries, the actual administration and recording of titles has been much more decentralized to provincial and municipal authorities in common law countries. In large part, this reflects the different historical development of land registration systems on the continent. However, the basic requirements of having agreed procedures to identify and transfer title to well defined properties is common to all of these countries.

A key element of the legal system in developed countries is the rules on the usage of personal property assets as collateral for lending. The legal and administrative procedures required when dealing with credit where land and real estate are used as collateral in developed countries are considerable. For example, in Canada and the USA, this process is closely regulated and requires some form of *public* registration of

non-possessory security interests.[7] These public registries have a long history in developed countries. In Canada the first public registry predates confederation, dating from the 1849 Bills of Sale Act of what was then the Province of Canada. This bill required that lending (such as mortgages) secured by collateral must be registered. If a mortgage was not properly registered, priority was granted to any subsequent claims of purchasers or lenders. This requirement continues to exist under current law (the PPSA), which has streamlined the registration process and led to the centralization of records in a single, province-wide computer database so as to reduce the costs of checking for existing liens.

The Canadian experience is by no means exceptional. As Ziegal (1974) points out, many of the innovations in Canadian law have followed changes introduced in the USA. Moreover, the timing in many Western European countries is broadly similar. For example, in 1844, a cadastre register and map were established in Denmark, and this was followed a year later by a land registry system established at local courts which could record and secure legal rights of property of ownership and mortgages (Ting et al. 1999).

The dramatically different situation present in many developing countries today can be illustrated by comparing GDP per capita to that of Canada historically. For example, GDP per capita in Canada in 1913 was similar to that of Ecuador and Peru in 2001, while countries such as Argentina have higher levels of real GDP per capita in 2001. These countries are frequently cited as examples of nations with poor land administration system as well as credit market imperfections. This suggests that the lack of these rights in these countries is not due simply to a lower level of GDP per capita than developed nations. This is an important point, since it suggests that differences in the land administration system are a potential explanation for differences in economic performance and wealth distribution across countries.

3 Wealth inequality and real estate

This section sets out some basic facts on the empirical linkages between land and real estate and wealth distribution. Unfortunately, there is a paucity of data on wealth distribution and real estate in many countries, especially in the developing world. As a result, we will devote more attention to reviewing what is known about the distribution of the components of wealth in developed countries such as the USA. There are two stylized facts that we wish to highlight. First, real estate and land account for a significant share of household portfolios. Second, the distribution of residential equity is more equal (at least in some developed countries) than total wealth.

[7] Moreover, there is an ongoing process of legal reform which attempts to improve the working of these credit markets (see Cuming et al. 2005).

The first fact is that land and real estate comprise a significant share of household wealth. Bertaut and Starr-McCluer (2002: 181-217) report that equity in the primary residence accounted for roughly 20 per cent of household net worth in the USA in 1998. For the median household in wealth distribution, home equity was more than twice as important, and accounted for roughly 43 per cent.[8] Moreover, while roughly two-thirds of households owned a home, less than half reported owning equity. The available data suggests that the USA is not atypical. For example, Guiso and Jappelli (2002: 181-217) report that the primary residence accounts for nearly half of the value of total assets held by Italian households. The available data also indicates that real estate comprises a significant share of household portfolios in developing countries. Davies and Shorrocks (2005) review the wealth distribution of the three largest (by population) developing countries—China, India and Indonesia. As can be seen from Table 1, housing and land appears to be even more important in the developing economies than in the developed countries.

Table 1: Housing and land share of household wealth

	USA 2001	China 1995	India 1991	Indonesia 1997
Housing %	32.5	36.2	40.3	48.7
Land %	n.a.	32.9	36.4	21.6

Source: Davies and Shorrocks (2005).

It is well known that the distribution of wealth is highly concentrated and unequally distributed even in countries with well developed land and real estate markets (Davies and Shorrocks 2000). For example, in the USA, the top 1 per cent hold roughly one third of total wealth, while the wealthiest 5 per cent hold more than half (Cagetti and De Nardi 2005).[9] A natural question is whether the distribution of real estate wealth is more or less unequal than that of net worth.

The evidence for the USA is that the equity held in housing is less unequally distributed than total wealth. Diaz and Luengo-Prado (2003) use the 1998 Survey of Consumer Finance to examine the distribution of net worth, consumer durables (residential housing and automobiles) and (net) financial assets. They find that the distribution of wealth (net worth) is more concentrated than earnings, with Ginis of 0.796 and 0.611, respectively. The distribution of durables is similar to that of earnings, with a Gini of 0.626, while the mean to median ratio is 1.52 versus 1.57 for that of earnings. Financial assets are much more concentrated, with a Gini of 0.953. Moreover, the value of durables as a fraction of total wealth is decreasing in the level of wealth. Diaz and Luengo-Prado (2003) report that for the bottom 40 per cent of households, durables

[8] They also report that the importance of residential real estate has been declining since 1983.

[9] While Wolff (1992) and others find that wealth inequality is slightly higher in the USA than other OECD countries, the qualitative patterns appear to be similar across countries.

account for 317 per cent of their total wealth while the top 20 per cent hold 29 per cent of their wealth in durables.

While the USA data suggests that housing wealth is less unequally distributed than total wealth, in some countries a different pattern has been found. Bauer and Mason (1992) review several estimates of wealth inequality in Japan, and find that housing and land are the principal sources of inequality in wealth. Davies and Shorrocks (2000) report that in South Korea land holdings is the single most important determinant of the concentration of wealth. A possible explanation of this difference is that financial assets are a much smaller share of reported household wealth in these countries.[10] As a result, land and housing are much more important as an apparent source of wealth inequality than in the USA.

4 Real estate titling and economic outcomes

There are several reasons why well defined and enforced rights to trade land and real estate should be good for economic outcomes. First, well-defined and publicly enforced tradeable property rights should provide better incentives for investment and labour supply. Second, freely tradeable property rights should lead to the allocation of resources to their most productive uses (Deininger and Feder 2001). Additionally, if agents face binding borrowing constraints for unsecured credit, the ability to use land assets as collateral for borrowing may significantly relax these borrowing constraints and facilitate both investment and intertemporal smoothing.

There is a large and growing literature investigating the potential impact of the system of titles to land on economic performance. Deininger and Feder (2001) argue that this literature suggests that all of the forces listed above are at work. In this section, we review the direct evidence of the effects of improving titles for increased output of certain members of different societies. This provides us with some initial insights into the potential effects of land titling systems on the wealth distribution. In later sections, we ask what economic theory can tell us about the likely effects of the borrowing constraints on wealth distribution.

4.1 Direct economic effect of land titles

There are several important effects of differences in the title status of land. First, within a country, there is a significant premium for land with clearly defined title relative to land without title (Deininger 2003). Deininger (ibid.) reports that studies in several countries have found that the premium for titled land ranges from 15 to 81 per cent. This provides direct evidence that titles provide significant economic benefits to land owners.

[10] The data used for these studies have been criticized for appearing to do a poor job of measuring financial assets.

Increased security of land title as well as transferability of land is associated with increased productivity and investment (Feder and Nishio 1999). Several papers have found that increases in tenure security—that is, the likelihood that the current owner of land will retain possession in the future—lead to increased investment (see Besley 1995; Li et al. 1998). Deininger (2003) also notes that the transition from collective to private farming in China was associated with large increases in productivity. Studies in other countries have also found that yields on titled land are higher than on untitled land as are inputs of land and fertilizer. However, in some cases 'traditional' systems of land ownership which feature limited private ownership also appear to offer sufficient tenure security to generate levels of investment comparable to those observed on privately owned plots.

Another potential benefit of secure, transferable land titles is better access to credit. The ability to use real estate as collateral can allow households access both to larger loans and more favourable terms, which in turn can facilitate increased investment by farmers. Deininger (2003) reviews a number of papers which conclude that land titles lead to substantial increase in borrowing by farmers. However, increased access to credit also depends upon the existence of credit markets institutions which facilitate access to information about outstanding liens and allow for easy foreclosure in the event of default. Additionally, there is also some evidence that land titling may not improve credit market access for very small holders of land (Deininger and Feder 2001). One example of this is a Paraguayan study by Carter and Olinto (2003), which found that while land title reform had a large positive impact on farmers overall, farmers with small plots of land (less then 20 hectares) did not gain increased access to credit. As a result, land titles may not improve access to credit markets for the least wealthy households.

An additional potential benefit of improved access to credit markets may be increased smoothing of income fluctuations. Kilenthong (2005) provides theoretical support for the view that increases in the quantity of assets with clear title can lead to better intertemporal smoothing of income fluctuations when households face borrowing constraints. However, as Deininger (2003) points out, using borrowing to smooth income fluctuation may have implications for wealth distribution. In particular, the potential for 'distress sales' in response to adverse income shocks may lead to a concentration of wealth distribution over time if the price of land during periods of low income tends to be much lower then during normal times. There is some evidence that this has happened in areas of Bangladesh, where land sales appear to be frequently motivated by a need to purchase necessities, and the Gini of land ownership has increased since 1960.

While there is considerable support for the view that a well functioning land titling system can lead to higher levels of GDP, the impact on wealth distribution is unclear. Given the substantial difference in the relative price of titled and untitled land, measured

wealth inequality may be less in countries where all real estate has clear title. Another potentially equalizing force is the possibility that better land rights might have the largest impact upon the poorest parts of the income and wealth distribution. In such a case, increased inequality within this group may be less of a factor then the increase in the average wealth of these households compared to other types of households in the economy.

There are several reasons to suspect, however, that better land titles might lead to increased wealth inequality. First, to the extent that households may differ in their ability to take advantage of the increased scope for more efficient production associated with better property rights, one might expect that both the income and wealth distribution could become more unequal with better land titling systems. For example, if the poorest households remain unable to access credit markets, then clear land titles may accentuate wealth inequality as middle and upper income households use better credit access to increase their income and wealth. In addition, increased risk sharing may lead to a less equal wealth distribution, as households facing riskier income fluctuations may reduce their savings of precautionary assets and increase borrowing.

These various forces suggest that the overall impact of land titling systems on wealth distributions is likely to be ambiguous. To get some idea about the likely magnitudes and directions of these forces we turn to recent work on understanding wealth distribution.

5 Theory: wealth distribution and real estate

In this section, we ask what current economic theory tells us about the likely effects of poorly functioning land titling systems on household portfolio choice and the distribution of wealth. The main channel we focus on is what happens when real estate becomes less useful as collateral to secure borrowing. This is a natural channel to focus on, since one effect of imperfect land titles will be a reduced willingness of lenders to use personal real estate as collateral for loans. This should translate into a smaller fraction of the value of real estate that can be used as collateral then if land titles were more clearly defined.[11] The evidence on mortgage lending across countries appears to be consistent with this interpretation. Buckley (1994) reports that a much smaller share of investment in housing in developing economics is financed via borrowing (mortgages) then in developed countries.

We first review two recent papers that explore the implication of different restrictions on the fraction of a durable good (housing) which can be used as collateral for borrowing for wealth distribution. Gruber and Martin (2003) and Diaz and Luengo-

[11] The use of real estate as collateral clearly requires both well defined ownership rights and well defined and functioning legal procedures for seizing collateral in the event of default. This is partially why we have maintained a broad definition of land titling systems in this paper.

Predo (2003) both incorporate a durable good into an incomplete market economy populated by infinitely lived agents similar to that of Aiyagari (1994).[12] While households are ex ante identical, the realization of stochastic earnings leads to ex post heterogeneity. The household utility function is defined over a non-durable consumption good and a flow of services from the stock of durables owned by the household. In addition, adjusting the stock of durables is subject to adjustment costs and households are assumed to have no access to unsecured credit but can use their holdings of the durable good to access secured credit.[13]

Diaz and Luengo-Predo (2003) report that a calibrated version of their model can closely match both the wealth distribution and the distribution of durable goods across households. In particular, they find that their benchmark parameterization generates a distribution of durables wealth that is similar to that of the earnings distribution, and a distribution of financial assets that also closely resembles the USA data. Gruber and Martin (2003) also do a good job of matching the fact that the distribution of durables is roughly as equal as the earnings distribution. However, the distribution of assets in their model is significantly less unequal than that observed in the Survey of Consumer Finances. This outcome is not surprising, as the calibration of the idiosyncratic shocks process to household labour productivity is very different in the two papers. Diaz and Luengo-Predo (2003) use an earnings process similar to that of Castaneda et al. (2003), which was chosen to generate a wealth distribution similar to that observed in the USA in a single asset economy. In contrast, in Gruber and Martin (2003) the earnings process is computed using households with a head aged between 25-55 years old in the Panel Study of Income Dynamics (PSID). As a result, the support and the persistence of the earnings process is much more compressed in Gruber and Martin (2003) then it is in the numerical exercises of Diaz and Luengo-Predo (2003).

Gruber and Martin (2003) and Diaz and Luengo-Predo (2003) use their calibrated model to undertake several counterfactual experiments on the effect of restricting the fraction of the durable that can be used as collateral. Interestingly, both papers find that reducing the down payment constraint leads to lower wealth inequality. In other words, they find that wealth inequality is higher when less collateralized borrowing is allowed. This is due to two forces. First, because households wish to consume durables, when borrowing is very limited, lower income low wealth households have an incentive to save so as to be able to purchase more durables in the future. However, when borrowing is permitted, this force is reduced as some households can finance their durables purchases by holding negative financial assets. This also leads to lower capital in the economy, which pushes up the equilibrium rate of return. This in turn generates increased wealth

[12] These papers build upon a (considerable) recent literature which uses dynamic general equilibrium models with heterogeneous agents to *quantitatively* account for the wealth distribution. Cagetti and De Nardi (2005) provide a useful summary of recent work on the wealth distribution.

[13] Hintermaier and Koeniger (2006) examine a similar framework with both secured and unsecured credit, but do not attempt to match the wealth distribution.

inequality by making wealthier households richer and poor households poorer. Second, the ability to borrow against part of the value of their durable holdings reduces the precautionary saving motive for low net worth households, which leads to a reduction in saving by these households which increases wealth inequality. However, it is worth noting, as Gruber and Martin (2003) point out, that in these environments the increase in wealth inequality caused by allowing collateralized lending is not 'bad' as ex ante welfare of the households increases as the borrowing constraints are relaxed and wealth inequality increases.

In related work, Fernandez-Villaverde and Krueger (2005) adopt a life-cycle framework to explore the implications of durables for saving and consumption over the life-cycle.[14] Instead of assuming that markets are incomplete, Fernandez-Villaverde and Krueger (2005) incorporate a durable good into a life-cycle version of Kehoe and Levine (1993). They also find that, for reasonable parameter values, their model does a good job of replicating the life cycle patterns of durable and financial asset holdings. Although they do not report wealth distribution, they also investigate the impact of limiting the fraction of the durable good which can be used as collateral. They find that this leads to less borrowing by young households, who instead concentrate their savings in the form of durables. As a result, the profile of lifetime consumption becomes more hump shaped. These findings suggest that wealth inequality in this environment is also likely to be increasing with the ease to which durables can be used as collateral. This credit market channel suggests that imperfectly defined land titles may actually tend to reduce wealth inequality. This in turn implies that policy reforms which improve the functioning of land and credit markets are likely to lead to higher wealth inequality. However, as noted, existing economic theory suggests that this increase in wealth inequality is not necessarily a bad thing, as it is associated with choices made by households that make them better off.

6 Entrepreneurship and wealth distribution

The large fortunes accumulated by entrepreneurs (households who have a considerable ownership stake and an active management interest in a business) accounts for a significant share of both total wealth and that of the wealthiest 1 per cent. Cagetti and De Nardi (2005) report that in 1989, more than 60 per cent of the richest 1 per cent of American households were entrepreneurs, and these households accounted for 68 per cent of the wealth held by the top 1 per cent. Hence, if the land title system influences household decisions to become an entrepreneur or the accumulation of entrepreneurial wealth, it could have a significant impact upon wealth distribution.

[14] Silos (2005) examines a life-cycle model with a financial market similar to Gruber and Martin (2003) and Diaz and Luengo-Predo (2003), but does not explore the implications of alternative down payment constraints.

One mechanism through which land titles could influence entrepreneurial decisions is via their influence on household borrowing constraints. Borrowing constraints may matter since households often borrow so as to (partially) finance the start up costs associated with opening a new business. In practice, a substantial fraction of borrowing by self-employed business owners is collateralized by personal assets. Using data from the USA Survey of Consumer Finance, Cagetti and De Nardi (2006) find that 29 per cent of self-employed business owners were using personal assets as collateral for business loans. The median ratio of the value of these loans to total business loans was 21 per cent, while for the top ten percent the ratio was 77 per cent. This is not just a USA phenomenon. Black et al. (1996) report that a significant component of small business lending in the UK is collateralized loans backed by personal assets. Hence, if poor land titles (or poor enforcement of mortgage contracts) make it difficult for (potential) entrepreneurs to use their real estate holdings as collateral for loans to finance a business, then some households may be unable to raise sufficient funds to open a business, or be forced to operate a smaller business than desired. This may be especially important for lower and middle class households, who tend to hold a larger fraction of their wealth in real estate than richer households.[15]

In the remainder of this section, we focus on whether land titling and credit market regulations significantly impact wealth distribution through entrepreneurship. There are two issues that need to be addressed to evaluate the likelihood that this effect would be significant. First, is there evidence that liquidity constraints matter for entrepreneurship? The second question is whether credit market distortions due to limited rights to utilize real estate assets as collateral are likely to have a significant impact on entrepreneurship and wealth distribution. Given the relative paucity of data on this point, we attempt to get some preliminary insights by reviewing existing theory on occupational choice and wealth.

6.1 Entrepreneurship and liquidity constraints

We begin by reviewing the empirical evidence on liquidity constraints. While the importance of liquidity constraints for entrepreneurship is the subject of current debate, there is some evidence (mainly from the USA) that they influence households decisions to start a business even in developed countries which have well developed financial and land registration systems. The limited evidence for developing countries appears to suggest an even larger effect, and also provides some direct support for the relationship between land titles and entrepreneurship.

[15] This story is closely related to that of de Soto (2000) who argues that the lack of effective land titles in developing countries means that the durable assets of poor and middle class households are ‘dead’ capital which cannot be as collateral by small business owners to support loans that could expand their businesses. De Soto (2000) argues that this plays a key role in explaining the large income differences between developed (Western) countries and developing nations.

A number of studies have concluded that borrowing constraints significantly influence household's decision to pursue entrepreneurial opportunities in developed countries. In a heavily cited paper, Evans and Jovanovic (1989) examined data from the National Longitudinal Survey of Young Men, and found that wealthier men were more likely to start their own business. They conclude that liquidity constraints both prevent some households from starting a business and lead to the operation of some businesses at lower levels of capital than is economically efficient. Holtz-Eakin et al. (1994) also conclude that liquidity constraints appear to matter for entrepreneurship. In particular, they found that receiving an inheritance increases the probability of a household continuing to operate their business and increases the value of sales. Black et al. (1996) used UK data, and found that increases in the value of net housing equity led to a significant increase in the rate of small business formation. They interpret this as supporting the importance of liquidity constraints.

Recent work by Hurst and Lusardi (2004) has challenged this view. They argue that the relationship between the probability of starting a business in the USA and household wealth is very nonlinear. Using data from PSID, they find a positive relationship between household wealth and the probability of starting a business for only the top 5 per cent of wealth distribution. They also find that the decision to start a business in low and high capital intensive industries does not vary much with wealth. Based on their analysis, they conclude that borrowing constraints do not appear to be empirically important for most small business formation in the USA. However, their interpretation of the data has been challenged by Cagetti and De Nardi (2005), who claim that models where (potential) entrepreneurs face binding liquidity constraints generate artificial data similar to that reported by Hurst and Lusardi (2004).

Given that the USA and other developed countries have relatively well functioning land registration and credit markets, one might think that households in countries with limited land titles or credit market distortions would face much tighter borrowing constraints. The limited evidence that is available for developing countries seems to suggest that this is the case. Paulson and Townsend (2004) provide one of the few studies of the impact of financial constraints on entrepreneurship in a developing country. They use a survey of households, village financial institutions and village key informants to determine whether financial constraints play an important role in determining entrepreneurship in Thailand. Their conclusion is that financial constraints have a significant impact on entrepreneurship, as wealthier households are significantly more likely to start a business than poorer households. Paulson and Townsend (ibid.) find a strikingly large difference between business and nonbusiness households in the percentage of households owning titled land. They report that roughly 50 per cent of the privately owned land in Thailand has full legal title (and hence can be used as collateral), while the remaining privately owned land cannot be sold or used as collateral. Since the vast majority of formal sector loans in Thailand are collateralized using land, households who own non-titled land likely face much tighter borrowing

constrains than similar households holding titled land. Their results suggest that this matters for entrepreneurship, as the median business operator in their sample had 10 times more land that could be used as collateral than did non-business households. Moreover, this difference was much larger than the difference in total assets or in the total value of land holdings.

In related work, Mesnard and Ravallion (2003) explore whether wealth distribution matters for the decision of households to start a business. They look at data on return migrants to Tunisia to see what factors influence the decision to become self-employed. Their empirical findings imply that the higher the initial level of wealth inequality, the lower is the rate of business start-ups. This finding provides further support for the existence of liquidity constraints in developing economies.

6.2 Theory: borrowing constraints, entrepreneurship and wealth distribution

The remaining question is what does current theory tell us about the likely qualitative and quantitative effect of land registration systems on entrepreneurship and wealth distribution? Since little work has been done to address this question explicitly, we review related work on the relationship between wealth distribution, entrepreneurship and borrowing constraints. To adopt these frameworks to our question, we (once again) make the assumption that the 'worse' the land registration system, the smaller the fraction of real estate wealth that can be used as collateral for a business loan.[16] Thus, to use existing theory to answer our question, we ask what happens as borrowing constraints are tightened.

The papers examining occupational choice and wealth constraints can be grouped into two categories, both of which assume that households face borrowing constraints due to imperfect financial markets.[17] The first category consists of papers which assume that households are identical except for their initial wealth holdings. These papers highlight how wealth inequality matters for economic performance and the evolution of wealth distribution over time. The second group of papers assumes that households differ not only in their initial wealth holdings, but also in other dimensions such as their productivity in different occupations.

We begin by asking what we can learn about the likely effects of land registration systems on entrepreneurship from models where households are identical in terms of preferences and abilities, and differ solely in terms of their initial wealth holdings. For brevity, we focus on Aghion and Bolton (1997) which is one of the more frequently

[16] This story also presumes that it is costly to sell/buy real estate, so that a household would prefer to use their home as collateral instead of selling it and investing the proceeds. This seems a reasonable assumption, especially if imperfect land title makes it difficult to legally sell real estate holdings.

[17] Some common reasons for imperfect financial markets include informational asymmetries and moral hazard as well as limited enforcement of debt contracts.

cited papers in this literature.[18] They examine a model where in each period households choose between being workers (using a technology whose only input is labour), or becoming entrepreneurs and operating the more productive 'capital-intensive' technology. This technology requires a fixed amount of capital to operate and its output is uncertain. However, the probability of success depends upon the (unobservable) effort invested by the household in operating the project. Since effort is costly, there is a moral hazard problem which causes the effort exerted by a household to be decreasing in the amount borrowed. As a result, low wealth households are credit constrained, and are unable to borrow enough to operate the capital-intensive project. Instead, they are 'stuck' in the low return sector until they are able to accumulate enough savings to enter the capital intensive sector.

The comparative statistics of reducing the fraction of household wealth that can be invested in the capital-intensive technology is surprisingly complicated, and depends upon the general equilibrium structure one assumes. Given any distribution of wealth, the direct effect of reducing the fraction of wealth that can be directly invested is to increase the number of credit constrained households who are forced to operate in the less productive sector. This reduces the income and savings of the newly credit constrained households relative to what would they would have been if the household were able to enter the entrepreneurial sector. This should lead to increased inequality of wealth inequality over time. Thus, one would expect that worse land registration systems should have higher levels of wealth inequality.

This conclusion depends, however, on whether capital is internationally mobile. If capital is mobile, then the domestic return on savings is not affected by the land registration system, so that there are no general equilibrium forces to offset the mechanism discussed above. However, if capital is not mobile, then the domestic interest rate may differ along with variations in the land registration system. The reason is that the increased number of credit constrained households in the poor land registration economy lowers the demand for borrowing, and increases the supply of lendable funds (since credit constrained households would want to save to be able to start a business in the future). This pushes down the equilibrium interest rate, which reduces the return on asset holdings of the wealthiest households and thus reduces wealth inequality. However, this also means that it takes longer for poor households to accumulate sufficient savings to start a business. As a result, the net effect on wealth inequality is unclear when capital is not mobile.

More recent work on entrepreneurship has relaxed the assumption that households differ only in their initial wealth holdings. The motivation for this is simple, as there is substantial evidence that households differ along other dimensions which influence both

[18] Another frequently cited paper is Banerjee and Newman (1993). See Bardhan et al. (2000: 541-603) for a review of the literature on the relationship between wealth inequality and economic outcomes.

their earnings ability as workers and their ability to run projects. This extra heterogeneity also turns out to affect the ability of these models to match the wealth distribution in the data.

We once again focus our attention on a representative paper, this time by Cagetti and De Nardi (2005). They examine a quantitative dynamic general equilibrium model where households can choose to become entrepreneurs or work for firms. Households differ both in their ability as workers and as managers. Cagetti and De Nardi (ibid.) examine a life cycle model in the sense of Blanchard (1985) with two stages of life: youth and old age. Young households face a constant probability each period of becoming an old agent, while old agents have a constant probability of dying each period. Old households are altruistic towards their descendants, and know that when they die their wealth holdings will be inherited by the new household that replaces them. New households receive an initial draw from the ability distribution of workers and entrepreneurial ability, both of which evolve stochastically over their life.

The key elements of Cagetti and De Nardi (2006) are the production sector and borrowing constraints. They assume that there are two sectors: the first a standard perfectly competitive sector that produces output using capital and labour. The second sector is the entrepreneurial sector, where entrepreneur i can produce output y using entrepreneurial ability θ^i and capital according to $y = \theta^i k^v$. This production structure implies that entrepreneurs face decreasing returns from investment and that the 'optimal' firm size is increasing in the ability of the entrepreneur (θ).[19] The borrowing constraint takes a relatively simple form. Cagetti and De Nardi (ibid.) assume that the only punishment for an entrepreneur absconding with any funds they borrow to become a worker is the loss of fraction f of their total investment. As a result, wealthier households can borrow more to finance their projects since their cost of defaulting is larger.

Cagetti and De Nardi (2006) calibrate and simulate their model. For reasonable parameter values, they conclude that their model does a good job of accounting for the both the USA wealth distribution and the distribution of entrepreneurial wealth. Their ability to match the wealth distribution depends partially on the fact that some households are very productive entrepreneurs who earn large returns from their managerial abilities but also have a significant savings motive due to being borrowing constrained. This saving incentive is amplified by the risk that their entrepreneurial ability may decrease, leaving them much less productive in the future. As a result, the

[19] In this environment, increased entry of entrepreneurs has an indirect effect on existing entrepreneurs via the economy wide rental rate of capital and the wage rate. This abstracts from potential effects due to 'crowding' associated with increased number of entrepreneurs attempting to make use of a fixed factor such as a natural resource. As pointed out by Shorrocks (1988: 241-8), this type of effect also matters for entrepreneurship and the wealth distribution

highest earning households in the model have high saving rates, which helps to generate a very skewed wealth distribution.

Cagetti and De Nardi (2006) report the results of several experiments with different borrowing constraints. Their results suggest (somewhat surprisingly) that wealth inequality decreases as borrow constraints become tighter.[20] This fall is driven by several forces. First, there is a decline in the fraction of the population that becomes entrepreneurs due to the increased savings required to become an entrepreneur. This happens despite the fact that the tighter borrowing constraint leads to an increase in equilibrium interest rates, which makes accumulating savings more attractive. The tighter borrowing restriction also means that households who do initiate small businesses find it more difficult to borrow, and hence run smaller firms that are less profitable. This leads to less wealth in the upper 1 per cent of the population, as the most productive entrepreneurs accumulate wealth at a slower rate. However, it is worth noting that the decrease in wealth inequality is associated with worse economic outcomes.

6.3 Summary: entrepreneurship and land titles

There is both empirical and theoretical evidence to support the view that poor land title systems adversely affect entrepreneurship. As emphasized by de Soto (2000), this also appears to lower output and productivity. However, current economic theory suggests that the relationship between land titles and the wealth distribution is ambiguous. On the one hand, the tighter borrowing constraints associated with the inability to use real estate as collateral for lending make it harder for low wealth households to become entrepreneurs. This tends to worsen the wealth distribution, by reducing the earnings and total savings of households who are pushed out of entrepreneurship. If households differ in ability, this force can reduce the size of businesses run by high ability but low wealth entrepreneurs while having little impact on the size of firms run by high ability high wealth households, which can further amplify wealth inequality. These effects are offset by the fact that tighter borrowing constraints make it harder for high ability entrepreneurs to accumulate very large fortunes by reducing the size of firms they operate.

This ambiguity suggests that future work in quantitative theory could be useful in helping to better identify the relationship between entrepreneurs, the wealth distribution and land title systems. Such work should also address several shortcomings with existing theory. First, the existing models are single asset frameworks, which focus on the role of the distribution of net worth. Given that land and real estate account for a larger fraction of wealth for middle income than high income households, this may be an important abstraction. As a result, a poor land registration system is likely to have the

[20] The results of these experiments also provide some support for the argument of de Soto (2000), as GDP decreases as the borrowing constraint is tightened.

biggest effect on middle wealth households' borrowing abilities, and a much smaller impact on the borrowing constraints of the very rich and the very poor. This introduces a force towards increased wealth inequality, as middle wealth households who have significant entrepreneurial ability face tight borrowing constraints which forces them to operate smaller firm and thus accumulate wealth more slowly than wealthy households of comparable ability. Relatedly, one might think that households planning to become entrepreneurs would change their portfolios and hold fewer durables goods if they knew that they could not be used as collateral.

7 Conclusion

There is growing evidence that well functioning land and real estate markets play an important role in economic outcomes. This has led to increased efforts by governments and international institutions to support reforms to land administration systems and credit markets in developing countries (Deininger 2003). The hope is that these reforms will increase output in developing countries, and thus lead to a reduction in the large differences in income and wealth across countries.

The potential impact of these reforms to land administration systems and credit markets on within country wealth inequality is unclear. The theory reviewed in this paper suggests, somewhat surprisingly that these reforms may be lead to increased wealth inequality. These reforms are likely to make it easier for households to use real estate as collateral for loans, which should allow households to both borrow more and on better terms. Standard theory suggests that this relaxation in borrowing constraints is likely to generate changes in household portfolio and entrepreneurship decisions that could increase wealth inequality. However, current theory also implies that there are likely to be forces pushing in the opposite direction due to increased access to entrepreneurial opportunities of households currently excluded from borrowing.

This ambiguity suggests that there is scope for further research to better understand the relationship between land administration systems, credit markets and the wealth distribution. Ideally, this work will also deal with several issues that both this paper and current theory abstract from. First, this discussion abstracted from the possibility of 'dual' systems of land rights. If certain groups in a country had access to land with well defined titles while others did not, then the implications for wealth inequality could be very different from the predictions of current theory. Another issue is the relationship between the price of land and the type of land title. There is evidence that land with poorly defined title sells at a discount relative to land with clear title, so that if households can freely choose between the two there may be little net effect of poor land title systems on the wealth distribution. Finally, we have abstracted from political economy arguments which claim that land titling restricts the ability of 'elites' to lobby government agents for preferential access to real estate when land titles are not formally defined or secured (Deininger and Feder 2001). To the extent that this type of behaviour

makes the wealth distribution more unequal, land titles may act to reduce wealth inequality. Future research which can quantify the importance of these questions is likely to offer further insights into the relationship between land titles and the wealth distribution.

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