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## Immigration and entrepreneurship in the United States

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# *Immigration and Entrepreneurship in the United States*

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## Immigration and Entrepreneurship in the United States

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### Abstract

Immigrants can expand labor supply and compete for jobs with native-born workers. But immigrants may also start new firms, expanding labor demand. This paper uses U.S. administrative data and other data sources to study the role of immigrants in entrepreneurship. We ask how often immigrants start companies, how many jobs these firms create, and how firms founded by native-born individuals compare. A simple model provides a measurement framework for addressing the dual roles of immigrants as founders and workers. The findings suggest that immigrants act more as “job creators” than “job takers” and play outsized roles in U.S. high-growth entrepreneurship.

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## 1 Introduction

Economic perspectives of immigration often emphasize its role in expanding labor supply (e.g., Isaac 1947, Borjas 1994, Dustmann et al. 2016). From this starting point, immigrants may primarily appear to compete with native workers, leading to reduced employment or lower wages (e.g., Altonji and Card 1991, Borjas 2003). Native-born workers and their representatives may then oppose immigration on the grounds that immigrants “take jobs” (e.g., Reder 1963, Briggs 2001). However, this perspective, while common in economic research and powerful in policy, does not appear to be the whole story. For example, studies of immigration shocks—including the Mariel Boatlift and others—often do not find negative effects on local wages (Card 1990, Hunt 1992, Friedberg 2001). And studies of mass migration to the United States have found substantial and persistent gains in per-capita income in regions that experience greater immigration (Tabellini 2020, Sequeira et al. 2020). The tension between a labor supply orientation and the broader empirical findings suggests that additional economic forces are at work.

This paper works to fill in the picture through the lens of entrepreneurship. We consider how immigrants not only expand labor supply (as workers) but also expand labor demand (as founders of firms). Using administrative data for the U.S. economy, we study the extent to which immigrants start new firms, and we study the employment in the firms they found. By looking in a more comprehensive manner at the U.S. economy, the analysis helps balance the ledger in assessing immigrants’ economic roles.

To provide a coherent analysis of supply and demand, we first present a simple general equilibrium model of the economy. This model, building on Lucas (1978), considers how individuals sort into workers and founders. We extend the model to consider the role of immigration. Intuitively, if immigrants start many firms but these are small firms, their effect on labor demand will still be small, so that immigration mainly expands labor supply and on net reduces wages. However, if immigrant-founded firms tend to be large firms, then immigration may substantially expand labor demand, raising wages. The theory makes this explicit. The model also engages firm size distributions, including Zipf’s Law, that can be brought to the data.

The empirical work then builds from three data sets. First, we use administrative records to study every firm founded in the U.S. between 2005 and 2010. Second, we use the U.S. Census’s Survey of Business Owners to study a representative sample of all U.S. firms. Third, we examine the Fortune 500, allowing us to focus on the very largest firms in the U.S. economy. In all cases, we code founders as either U.S. born or immigrant based on their place of birth. Using any of these data sets, we find similar results. First, reflecting existing research, immigrants start firms at higher rates than native-born individuals do (e.g., Kerr and Kerr 2020). Second, immigrants do not simply start small firms. Rather, they tend to start more firms at every size, compared to U.S.-born individuals. This is the key finding of the paper. There is effectively a “right shift” in entrepreneurship for immigrants, with immigrants playing relatively large roles as employers rather than employees, compared to U.S.-born individuals.

Overall, the findings suggest that immigrants appear to “create jobs” (expand labor demand) more than they “take jobs” (expand labor supply) in the U.S. economy. By studying immigrants as both entrepreneurs and workers, one produces a fuller picture of the impact of immigration. The new facts can help resolve existing puzzles where empirical evidence, including natural experiments and longer-run historical analysis, often suggests more positive economic effects from immigration than labor-supply oriented perspectives produce.

The paper proceeds as follows. Section 2 further motivates our study. Section 3 presents a simple model, generating key intuitions and clarifying basic empirical constructs. Section 4 presents the empirical results and our central findings. Section 5 considers interpretations and extensions, including patenting behavior. Section 6 concludes.

## **2 The Immigrant Entrepreneur**

While researchers often study immigrants as workers, a recent stream of scholarship emphasizes the role of immigrants as inventors and entrepreneurs. For example, immigrants are disproportionately likely to account for U.S. patents (e.g., Bernstein et al. 2019) and hold STEM degrees (Kerr and Kerr 2020). Immigrants further appear to be highly entrepreneurial. Immigrants start firms at higher rates than native-born individuals in several countries (Fairlie and Lofstrom 2015), including the U.S. (Kerr and Kerr 2020). At the same time, such entrepreneurial tendencies may largely

reflect businesses with limited growth prospects, perhaps because immigrants are “pushed” into entrepreneurial activity due to poor labor market opportunities (Light and Roach 1996, Constant and Zimmerman 2006). On the other hand, evidence also points to the substantial presence of immigrant founders in Silicon Valley (e.g., Saxenian 2002), and examples such as Alexander Graham Bell and Sergei Brin suggest that immigrants have started firms that grow to employ large numbers of people, with large effects on the economy.

Ultimately, the economic effects of immigration will depend not just on whether immigrants start firms, but on how successful these firms tend to be. In this paper, we will provide systematic evidence on this question. Intuitively, examining the size distribution of businesses, and comparing this for immigrant and native-born founders, can shed light on the impact of immigrant entrepreneurship. We will examine the size distributions using administrative data and other data sources. To provide intuition and make the measures precise, we first develop a simple conceptual framework.

### **3 Model**

Immigrants can expand both labor supply (as workers) and labor demand (as employers). Immigrants, as earners of income, also create more demand for final goods. The following model builds on Lucas (1978) and to introduce such general equilibrium reasoning. We extend this classic model to consider the role of immigrants and provide explicit constructs that can be examined empirically.<sup>1</sup>

#### **3.1 Assumptions**

Let there be  $N$  people in the economy, where individuals can choose to either work in a firm (“workers”) or start a firm (“founders”). Each person is endowed with 1 unit of labor. Each person is also endowed with some level of entrepreneurial acumen. The entrepreneurial acumen for individual  $i$  is  $a_i \geq 0$ , which is distributed  $f(a)$ . The (endogenous) number of founders is  $E$  and workers is  $L$ , where  $E + L = N$ .

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<sup>1</sup>See also Feyrer (2011) for analysis of demographics in the context of the Lucas (1978) model.

Firms maximize profits. They produce with a decreasing returns-to-scale technology, and productivity depends on the entrepreneur's skill. These features allow for positive profits and a size distribution of firms in equilibrium. Specifically, a firm's output is

$$y_i = a_i l_i^\beta \quad (1)$$

where  $\beta \in (0, 1)$  and  $l_i$  is the labor employed. The profit maximization problem is

$$\pi_i^* = \arg \max_{l_i} [y_i - w l_i] \quad (2)$$

where the final good price is taken as numéraire (there is one type of output).

Individuals choose their career to maximize income. They can work for a wage,  $w$ , or start a firm and earn profit  $\pi_i^*$ . Individuals choose to become entrepreneurs if  $\pi_i^* \geq w$  and choose to be workers otherwise. Utility is strictly increasing in consumption of the final good. Individual-level consumption is thus equated to individual-level income, and total consumption is equated to GDP.

Finally, we consider two sub-populations, indexed  $j \in \{0, 1\}$ , to represent the native-born and immigrants, respectively. The total population is partitioned as  $N = N_0 + N_1$  and we similarly partition  $L = L_0 + L_1$  and  $E = E_0 + E_1$ . The distribution of entrepreneurial acumen for each group is  $f_0(a)$  and  $f_1(a)$ . The overall distribution of acumen in the economy is the summation of these two sub-population distributions, each weighted by its population share. Results below will (eventually) specialize to consider Pareto-like distributions,

$$f_j(a) = \begin{cases} \gamma_j a_j^{\gamma_j} / a^{\gamma_j+1} & \text{if } a_j \leq a < a_{max} \\ (a_j / a_{max})^{\gamma_j} & \text{if } a = a_{max} \end{cases} \quad (3)$$

where the parameters  $a_j > 0$  and  $\gamma_j > 0$  are the Pareto scale and shape parameters and the support is capped at some (very large)  $a_{max}$  to guarantee finite moments.

### 3.2 Equilibrium Results

We emphasize two sets of results, helping frame the empirical work to follow. The first set provides more general statements about equilibrium outcomes in light of immigration. The second set considers Pareto-like distributions of entrepreneurial talent, which provide a close match to the data.



To solve for the equilibrium allocation, we have firm-level profit maximization and the individual career decision. These are the choices in the economy. We close the model through the resource constraints, which are the total available population and, most importantly, the distributions of entrepreneurial acumen for the native-born and for immigrants.

First, from profit maximization, profits are strictly increasing in the individual acumen,  $a_i$ .<sup>2</sup> The entrepreneurship decision then implies a threshold value  $a^*$ , where individuals choose entrepreneurship if  $a_i \geq a^*$  and choose to be workers otherwise. This threshold level of acumen is

$$a^* = \frac{w}{\beta} \left( \frac{\beta}{1-\beta} \right)^{1-\beta} \quad (4)$$

for any distribution of talent,  $f(a)$ . This equilibrium condition provides a monotonically increasing relationship  $a^*(w)$ . This produces an upward sloping labor supply relationship; namely, a higher wage means that more people choose to be workers.<sup>3</sup>

Second, the share of entrepreneurs in the population is

$$\frac{E^*}{N} = \int_{a^*}^{\infty} f(a_i) da_i \quad (5)$$

which is decreasing in  $a^*$ . Fewer founders means less labor demand, other things equal, leading to a second, decreasing relationship between  $a^*$  and  $w$ . The above two conditions together can thus pin down the equilibrium wage and entry threshold decisions.

Aggregates follow by adding up the firm-level variables. Total output per capita is

$$\frac{Y^*}{N} = \int_{a^*}^{\infty} y_i^* f(a_i) da_i. \quad (6)$$

We can similarly add up firm-level labor demands,  $l_i^*$ , and profits,  $\pi_i^*$  to produce aggregate labor,  $L^*$ , and aggregate profit,  $\Pi^*$ . Equating total income to GDP, it follows, for any  $f(a)$ , that the labor share of total income is  $wL/Y = \beta$  and the profit share is  $\Pi/Y = 1 - \beta$ .

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<sup>2</sup>Profit maximization, (2), provides firm-specific labor demands  $l_i^* = \left( \frac{\beta a_i}{w} \right)^{\frac{1}{1-\beta}}$ , outputs  $y_i^* = a_i^{\frac{1}{1-\beta}} \left( \frac{\beta}{w} \right)^{\frac{\beta}{1-\beta}}$ , and profits  $\pi_i^* = a_i^{\frac{1}{1-\beta}} (1-\beta) \left( \frac{\beta}{w} \right)^{\frac{\beta}{1-\beta}}$ .

<sup>3</sup>Rather than a choice between work and leisure, here we mean the choice between being a worker ( $L$ ) and a founder ( $E$ ). The phrases “labor supply” and “labor demand” in this construct refer to workers.

### 3.2.1 Immigration and Equilibrium

The influence of immigration can be understood by analyzing how immigration shifts the overall distribution  $f(a)$ . Consider three informative cases and the following proposition.

1. Immigration causes no shift in the distribution  $f(a_i)$ .
2. Immigration creates a left shift in the distribution  $f(a_i)$  such that  $f(a_i)$  decreases for all  $a_i \geq a^*$ .
3. Immigration creates a right shift in the distribution  $f(a_i)$  such that  $f(a_i)$  increases for all  $a_i \geq a^*$ .

**Proposition 1.** *The threshold for entrepreneurial entry,  $a^*$ , is unchanged in case 1, decreasing in case 2, and increasing in case 3. The equilibrium wage ( $w^*$ ), GDP per capita ( $Y^*/N$ ), and total profits per capita ( $\Pi^*/N$ ) move in the same direction as  $a^*$ .*

*Proof.* See appendix. □

These results are intuitive. In the first case, immigrants are just like the native born. They split into workers and entrepreneurs just like the native born do, and immigrants have no net effect on the equilibrium between labor supply and demand. Immigrants increase the scale of the economy, by increasing total population, but they don't change wages or other outcomes per person.

In the second case, immigrants tend to have less entrepreneurial acumen. Compared to the native born, a relatively high share of immigrants become workers (pushing out labor supply) rather than entrepreneurs (pushing out labor demand), and equilibrium wages fall. This case corresponds to often-expressed fears that immigration worsens wages for native workers.

In the third case, immigrants tend to have more entrepreneurial acumen than the native born. Although many immigrants become workers, a relatively high share now become business founders, so that the labor demand effect outweighs the labor supply effect, causing the wages of native-born workers to rise. GDP per capita and profits per capita also rise.

One can further aggregate the total employment created by firms from a given population of founders, leading to the following additional result.

**Corollary 1.** *The total number of jobs created by immigrants is the same as the number of immigrants in the population in case 1, less than the number of immigrants in case 2, and greater than the number of immigrants in case 3.*

*Proof.* See appendix. □

This corollary is another way of seeing the labor market implications of immigration. The net job creation effect (quantity), like the net wage effect (price), is increasing in immigration if immigrants have an advantageous distribution of entrepreneurial acumen.

Note that while case 3 increases wages and per-capita income, it is not a Pareto improvement without a transfer. Although workers are better off, and total profits go up, an individual native-born entrepreneur sees his/her profit fall. This follows because, given that entrepreneur's  $a_i$ , the firm's profits decline when the wage increases. That said, from an inequality point of view, the individuals who see less income in this case are those who are relatively well off.

In the data, we will examine entrepreneurial entry rates and the firm size distributions when looking separately at the native-born and immigrant populations. Specifically, we count the number of founders per member of a given population,  $e_j^* = E_j^*/N_j$ , providing an entrepreneurial entry rate. To examine the distribution of firm size for each population, we count the number of firms of a given employment size,  $c_j(l_i^*)$  normalized by the size of that group's population,  $N_j$ , and plot this by firm size.

One can develop further results using these measures by specializing to Pareto-like distributions. Consider the businesses founded by a given population  $j$ .

**Corollary 2.** *For the distribution (3) and  $a < a_{max}$ , the slope of the log normalized firm count  $c_j(l_i^*)/N_j$  in the log firm size  $l_i^*$  is*

$$s_j = -1 - \gamma_j(1 - \beta) \tag{7}$$

*Proof.* See appendix. □

The firm size distribution thus follows a constant slope in logs – Zipf’s Law (Axtell 2001). The Pareto distribution may thus be useful in matching power laws in the data. Further, anticipating the empirics, we find that immigrants start firms at substantially higher rates than native-born individuals but that the slopes of the firm size distributions are similar (if not exactly the same) for both populations, suggesting an approximately common Pareto shape parameter ( $\gamma$ ). Defining each group’s population share as  $n_j = N_j/N$ , we can then consider further, explicit equilibrium results.

**Corollary 3.** *For the distribution in (3) with common slope parameter  $\gamma$ , the relative entrepreneurial entry rates are*

$$\frac{e_1^*}{e_0^*} = \left( \frac{a_1}{a_0} \right)^\gamma. \quad (8)$$

*The equilibrium wage and per-capita income, with large  $a_{max}$ , vary with the immigrant population share as*

$$\frac{d \log x^*}{dn_1} = \theta \frac{a_1^\gamma - a_0^\gamma}{a_0^\gamma n_0 + a_1^\gamma n_1} \quad (9)$$

*for  $x^* \in \{w^*, Y^*/N\}$  and where  $\theta = 1/\gamma$  if  $\gamma(1 - \beta) \geq 1$  and  $\theta = 1 - \beta$  if  $\gamma(1 - \beta) < 1$ .*

*Proof.* See appendix. □

As with the general case in Proposition 1, equilibrium wages are increasing in immigration if the immigrant distribution of entrepreneurial acumen is right-shifted compared to the native population. For the Pareto approach in Corollary 3, a right shift in the acumen distribution for immigrants follows from  $a_1 > a_0$ . This will be seen as a parallel right shift in the firm size frequency per group member – i.e., more entrepreneurial entry by immigrants across the firm size distribution.

## 4 Empirical Evidence

This section presents empirical evidence, comparing native-born and immigrant founded firms. We describe the primary data sets, the specific empirical measures, and the key findings.

## **4.1 Data**

We use three independent data sets. Our primary analysis uses administrative data to study all new firms in the United States from 2005-2010 (“administrative data”). Our second analysis studies the U.S. Census Bureau’s 2012 Survey of Business Owners, a representative sample of U.S. businesses and their owners (“representative sample”). Our third analysis studies the Fortune 500 to consider the country’s largest firms and their founders (“Fortune 500”). We describe these data sets here, with additional detail in the appendix.

### **4.1.1 Administrative Data**

This data set links the U.S. Census Bureau’s Longitudinal Business Database (LBD), population-wide W-2 tax records, and the U.S. Census demographic files (Numident). Business-level information comes from the LBD, which tracks U.S. businesses and their establishments over time. The LBD includes all non-farm private-sector firms in the U.S. with at least one employee. Our focus in the LBD is on startups, to examine entrepreneurship by native and immigrant populations.

To study founders, we integrate employment and demographic records. We use a “founding team” definition, identifying the top three earners (via W-2 records) in each new venture in its founding year (Kerr and Kerr 2017; Azoulay et al. 2020). We then classify each founding team member as either U.S.-born or immigrant, based on the country of birth (via Census Numident). Using W-2 records and Census Numident, we similarly classify all workers in the economy as U.S.-born or immigrant. We also consider alternative measures of the immigrant population.

To examine employment outcomes, we study the firm size distributions for U.S.-born and immigrant founded firms five years after founding. Given data set availability, our main analysis considers all 1.02 million firms founded from 2005-2010 that survive for five years. A benefit of the administrative data is that it covers all new employer firms in the economy. The limitation is that we see employment outcomes only in the early years of the business. This motivates our second data set, which is a representative sample of U.S. business owners.

#### **4.1.2 Survey of Business Owners**

The Survey of Business Owners (SBO) collects information about businesses and their owners from a representative sample of U.S. firms. The survey includes employer and non-employer businesses, and we focus on employer businesses. The SBO is collected every 5 years. For our exercise we use the 2012 SBO.

When looking at business owners, the SBO collects detailed information for the top four owners, including their ownership shares, founder status, whether they are native or immigrant, and whether they play an active role in managing the firm. We limit our analysis to businesses with at least one founder amongst the top four owners. Our analysis is strictly limited to the founders (i.e., we exclude investor-owners who did not found the firm).<sup>4</sup> Our analysis sample includes over 200,000 employer firms.

For firm-level employment, we use the survey-collected data. Noting that sample coverage is relatively thin at very large firm sizes, and yet a very small number of firms are extremely large and responsible for substantial employment, we therefore turn additionally to a third data set, the Fortune 500, to explicitly examine this upper tail.

#### **4.1.3 Fortune 500**

We further collect data on firms in the 2017 Fortune 500 ranking. For each firm, we capture, whenever possible, the founding year, founder names, and founder countries of birth. This process is straightforward for many firms, particularly those founded in the recent past. It is more challenging when firms are the offspring of many merged entities. Our approach is to trace the “genealogical tree” for each firm to the earliest parent possible and then identify the founders of these parents as the founders of the firm. Among the Fortune 500, we were able to determine the country of birth for the founders for 449 firms. The founding years range from 1743 to 2004. Further details regarding the data collection are provided in the appendix.

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<sup>4</sup>In examining firms where a current owner was also a founder, we are limited to studying firms where a founder has survived. Thus this sample will emphasize firms founded in recent decades as opposed to very old firms.

## 4.2 Measures

We define individuals as immigrants if they are born outside the U.S.. For each data set, we count the number of entrepreneurs from each population. We similarly examine the firms' employment distribution, counting firms of a given size from founders in each population and normalizing these counts by the size of each population. These measures produce the rate of entrepreneurship ( $E_j^*/N_j$ ) and the fraction of individuals who start firms of a given size ( $c_j(l_i^*)/N_j$ ).

Firms can have multiple founders, and these founders may mix U.S.-born and immigrant individuals. Allocating firms as either native-founded or immigrant-founded can then be done multiple ways. We consider three different approaches to assigning firms to each sub-population. The first approach, denoted Definition 1, counts the business as an “immigrant firm” if anyone in the founding team is an immigrant. This method is most generous in counting immigrant firms. The second approach, denoted Definition 2, counts the business as an “immigrant firm” only if the “lead” individual is an immigrant. This approach is more conservative. We operationalize the “lead” individual as the highest-paid on the founding team (administrative data) or the owner-worker with the highest ownership share (SBO data).<sup>5</sup> The final approach, denoted Definition 3, uses proportional assignment. It collects all firms in a given employment size range and pools the founding teams among this group of firms. It then allocates these firms proportionally (within the given size range) as native-founded versus immigrant-founded, based on the share of founding team members from each population. These three definitions produce alternative frequency distributions,  $c_j(l)$ , and founder counts  $E_j$  for each population, acting as robustness checks.

To produce appropriate population normalizations,  $N_j$ , for each group, we also have reasonable alternatives. We can consider all individuals who work (e.g., from all W-2 records) in each group, or we can consider broader estimates to account for informal employment and unauthorized immigration. Broader population measures also account for historical immigration levels, which is especially relevant for the Fortune 500 data. In practice, the results appear robust to any plausible estimate of the immigrant population (see Section ??).

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<sup>5</sup>This second approach is not feasible for the Fortune 500 data.

### 4.3 Results

The central results are presented in Figures 1, 2, and 3. Each figure shows the normalized firm size distributions ( $c_j(l_i^*)/N_j$ ) for immigrant-founded and native-founded firms. The broad finding is clear, looking across each data set and across different ways of defining immigrant and non-immigrant firms. Namely, immigrant entrepreneurship presents a “right shift,” where immigrants tend to start more firms per person of every size. Specifically, at each firm size, the frequency of immigrant-founded firms per immigrant in the population tends to be larger than the frequency of native-founded firms per native-born person in the population.

#### 4.3.1 Administrative Data

Figure 1A presents the administrative data, counting immigrant firms as those with at least one immigrant founder (Definition 1). We see here a parallel right shift for immigrant-founded firms. The rate of entrepreneurship looking at the 2005-2010 period shows that 0.83% of immigrants in the workforce start a firm, compared to 0.46% of native-born individuals in the workforce.<sup>6</sup> Immigrants thus exhibit a 80% higher entrance rate into entrepreneurship. Moreover, immigrants do not just start many small firms; rather, they start more firms of every size.<sup>7</sup>

Figure 1B considers the administrative data again, but now counts immigrant firms only as those where the highest-paid founding team member is an immigrant (Definition 2). The immigrant firms defined this way are now a strict subset of those pictured in Figure 1A. While the power law for the immigrant-founded firms necessarily moves left compared to Figure 1A, we still see that, at every firm size, immigrant-founded firms outpace the native-founded firms. Now the slope is slightly steeper for immigrant-founded firms, so that they dominate relatively more among small firms, and only slightly among the largest firms.

Figure 1C considers a proportional assignment of immigrant and native-founded firms (Definition 3). The result looks very similar to Definition 2. A small difference is that now, in the very largest size bucket, immigrant-founded firms are slightly outpaced by native-founded firms. Nonetheless, aggregating across firms, the job creation rate is much greater among immigrants.

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<sup>6</sup>Although this is census data, a sampling error perspective would indicate enormously significant differences in these entry rates, with standard errors of 0.0019% (immigrants) and 0.0006% (natives).

<sup>7</sup>Immigrants also start firms quite quickly after entry to the United States—see Appendix B.



Specifically, the total employment assigned to immigrant-founded firms per immigrant in the workforce is 1.49 times larger than the total employment of native-founded firms per native worker in the workforce.

### **4.3.2 Survey of Business Owners**

Figure 2 repeats the analyses of Figure 1, but now using the Survey of Business Owners (SBO). As we consider a much longer history of founding years, for which do not have W-2 records, here we normalize the firm counts by historical immigrant and native-born population counts, weighting by the founding years of the enterprises.<sup>8</sup> Figure 2A shows the normalized firm size distributions using Definition 1. As before, we see a right shift in the distribution for immigrant-founded firms, with immigrants starting disproportionately more firms across the size distribution.<sup>9</sup> The estimated rate of entrepreneurship based on the 2012 set of businesses is 80% higher for immigrants compared to native-born individuals. Remarkably, despite measurement differences from the previous section, we find that immigrants exhibit the same 80% higher entrance rate into entrepreneurship when compared to native-born individuals.

Figure 2B considers the SBO data again, now counting immigrant firms as only those whose largest owner-share founder is an immigrant (Definition 2). Once again we see a right-shift of the firm size distribution for immigrant-founded firms but now with a tilt where the size distributions converge as we increase in size. This result is again similar to the pattern observed in the administrative data.<sup>10</sup> Figure 2C considers a proportional assignment of immigrant and native-founded firms (Definition 3). The right-shift of the log size distribution for immigrant founded firms remains. The results are broadly similar as when using the prior definitions.

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<sup>8</sup>Population information is sourced from the Migration Policy Institute tabulation of the 2010-2017 American Community Surveys and 1970, 1990, and 2000 Census data, and Gibson and Lennon (1999) for further historical data. Our conclusions are also robust to reasonable assumptions on the size of the unmeasured immigrant population (see Appendix A).

<sup>9</sup>To comply with disclosure avoidance rules, we suppress data for firms above 10,000 employees as well as specific cells in Figure 2.

<sup>10</sup>The SBO definition, which is based on the largest current ownership share among the founders, might select against immigrant founders to the extent that native-born founders are initially more affluent and can invest more.

### **4.3.3 Fortune 500**

Figure 3 considers Fortune 500 firms. This analysis provides a close look at the very largest firms in the economy and further allows for some historical comparison. Because the data is more sparse (449 firms with founder information, 96 of which have at least one immigrant founder), we create only three employment bins (using the 2017 employee count for each firm): Firms with less than 30,000 employees, firms with between 30,000 and 100,000 employees, and firms with more than 100,000 employees.<sup>11</sup>

The results are depicted in Figures 3A and 3B (corresponding to founder counts according to the first and third definitions, respectively). The patterns observed are broadly consistent with those obtained earlier: a right shift for immigrant-founded firms. As shown in the appendix, similar results appear when looking at Fortune 500 firms founded since 1970, further revealing the contemporary relevance of the right shift when looking among upper tail firms. Overall, the Fortune 500 findings indicate that the results extend to the very largest U.S. businesses and to founding behavior over a broader sweep of U.S. business history.

## **4.4 Jobs and Wages**

Following Proposition 1 and Corollary 1, a right shift in the entrepreneurial acumen distribution for immigrants creates a net labor demand effect, where immigrants on net raise workers' wages and are net job creators. Calculating jobs created per member of the population in the administrative data (Figure 1), we find that this ratio is at minimum 49% higher for immigrants than for the native-born, consistent with the visible right shift in the figures and Corollary 1.<sup>12</sup>

Corollary 3 allows a more specific calibration of the wage gains. For example, taking an 80% higher rate of entrepreneurship (as found in the administrative data or SBO data using Definition 1), one infers an 80% upward shift in the Pareto scale parameter for the immigrant population (see [8]). Given the observed slope of the firm size distribution and taking a labor share of income of

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<sup>11</sup>We normalize the founder counts using group population estimates in the decade during which the firm was founded, following the same procedure as with the SBO. See appendix.

<sup>12</sup>The 49% rate is for Definition 3. Immigrant job creation is 59% higher using Definition 2 and over 100% higher using Definition 1.

$\beta = 2/3$ , one can then calculate a 0.24% increase in the economy's wages and per-capita income for a one percentage point increase in the immigrant population share.<sup>13</sup>

## 5 Discussion

In this section, we first summarize the results and relate them to the theory. We then consider further interpretations of the findings and related evidence.

### 5.1 Summary

Overall, immigrants appear highly entrepreneurial. We see a power law in the distribution of firm size for each population, but immigrant entrepreneurship appears right-shifted. Specifically, there tend to be more immigrant-founded firms, per immigrant in the population, at each employment size. This is true recently, looking at all new firms in the economy using administrative data. It is also true for firms founded in earlier time periods, including when studying the Survey of Business Owners and the Fortune 500.

Relating to the theory, the higher rate of entrepreneurship, right shift in the firm size distribution, and higher count of jobs created per population member are all consistent with immigrants presenting an advantageous distribution of entrepreneurial acumen, compared to native-born individuals. According to Proposition 1, this feature is consistent with increased wages and rising income per capita.

### 5.2 Wages

The conceptual framework has emphasized heterogeneity in entrepreneurial acumen and resulting outcomes in the firm size distribution, with one type of worker (receiving a common wage). More generally, one can look beyond the firm size distribution to consider the wages these firms pay. Specifically, one might wonder whether immigrant-founders, although they create a large number of jobs, perhaps do not create high-paying jobs.

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<sup>13</sup>This calculation uses a slope of 1.78, which is the firm size distribution in the SBO data using any of Definitions 1, 2, or 3. The appendix provides the slopes of all firm size distributions plotted in Figures 1 through 3 (Table B2) and further calibration information.

The appendix and Table B1 use W-2 tax records to estimate worker-level wage regressions, comparing the wages paid in immigrant-founded versus native-founded firms in the administrative data. In a bivariate regression, workers in immigrant-founded firms receive 4.1% higher wages on average. Controlling for founding year and county, however, the wages become identical for workers in immigrant and native founded firms. Additionally controlling for sector as well as worker characteristics, including age, gender, and immigrant status, the wage differences continue to shift somewhat and can flip sign. With all the controls we find that the wages are similar, with a slightly higher wage (0.7%) in immigrant-founded firms. Overall, these findings suggest that immigrant founders not only are substantial job creators but also do not appear to create lower paying jobs.

### **5.3 Technology Businesses**

Immigrants are disproportionately likely to hold STEM degrees (Kerr and Kerr 2020) and play notable roles in major entrepreneurial ecosystems like Silicon Valley (Saxenian 2002). To study the technological and inventive orientation of immigrant versus non-immigrant startups, we further consider patenting behavior. This analysis links the corpus of U.S. patents to each firm in the administrative data, studying all firms founded over the 2005-2010 period. Figure 4 presents the results. Overall, firms with an immigrant founder are 35% more likely to have a patent than firms with no immigrant founders. Studying firms by size group, those founded by immigrants are more likely to have patents at all sizes and especially at larger sizes.<sup>14</sup>

To the extent that inventive firms bring productivity gains beyond the bounds of the firm, entrepreneurship can play additional welfare roles. Large literatures find substantial spillovers and high social returns from innovation investments (e.g., Hall et al. 2010, Bloom et al. 2013, Jones and Summers 2020) and emphasize that technology advances play critical roles in driving rising standards of living (e.g., Mokyr 1990, Cutler et al. 2006). Conceptually, the model in Section 3 emphasized a general equilibrium allocation without innovative spillovers. Adding productivity

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<sup>14</sup>These results are largely consistent with Brown et al. (2020) who find higher rates of innovation among immigrant-founded startups in the American Survey of Entrepreneurs.

spillovers from inventive firms leads to the intuitive result that immigrant entrepreneurship can further enhance productivity, wages, and per-capita income in the economy as additional benefits.<sup>15</sup>

## 5.4 Immigration and Selection

Overall, the picture is a rightward shift in the firm size distribution.<sup>16</sup> Amidst a potentially rich set of underlying mechanisms, the findings are broadly consistent with immigrants being positively selected on entrepreneurial acumen. Various forces may explain this. For example, low ability individuals may face difficulties migrating, and many U.S. visa classes select on high ability (e.g., Chiswick 1999; see also McKenzie et al. 2010, Hendricks and Schoellman 2018). More broadly, the act of migration itself may suggest an entrepreneurial orientation; for example, the historical literature in the United States emphasizes a “frontier” spirit, associated with adventurous migrants and “a practical, inventive turn of mind” (Turner 1921), and some contemporary literature has found that migrants are less risk averse (Jaeger et al. 2010).

To investigate the breadth of an entrepreneurial orientation among immigrants, we further considered immigrant outcomes comparing those born in OECD countries with those born in non-OECD countries, representing source countries with very different per-capita income levels and other characteristics. We find that the normalized firm size distributions for these sub-groups are nearly identical, and both are substantially right-shifted compared to firms founded by the native U.S. born (see Figure B3). These findings further suggest a broad right-shift in entrepreneurial acumen among immigrants, consistent with positive selection orientations.

## 6 Conclusion

This paper has studied the relative roles of immigrant and native-born individuals in new venture formation in the United States. Using administrative data, a representative sample, and Fortune 500 data, we present new findings on the size of firms these different founder populations create. Across all three data sets, we find that immigrants present a “right shift” in new venture

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<sup>15</sup>Separately, investigating why immigrant entrepreneurs have technology orientations and growth success is an important area for continuing work, and can draw on demographic, educational, and network factors, among others (e.g., Kerr and Lincoln 2010, Peri et al. 2015, Liang et al. 2018, Azoulay et al. 2020).

<sup>16</sup>We also see a preponderance of immigrant-founded small businesses in some analyses. This is consistent with “push” mechanisms into entrepreneurship (e.g., Light and Roach 1996) among other forces. Unpacking distinct and perhaps differential mechanisms across the firm size distribution are important areas for further work.

formation, where immigrants tend to start more firms of each size per member of their population. A simple theoretical framework provides intuition for thinking about these roles and helps make the measures precise.

Overall, the entrepreneurial lens suggests that immigrants appear to play a stronger role in expanding labor demand relative to labor supply, compared to the native-born population. These findings can help resolve the tension between labor supply oriented analyses (e.g., Isaac 1947, Borjas 1994, Dustmann et al. 2016), where immigrants are seen to compete with local workers and depress wages, and natural experiments that often show more positive economic results of immigration for native-born workers (e.g., Card 1990, Hunt 1992, Friedberg 2001). At the same time, immigrants can play broader economic roles than examined in this paper, and additional theoretical and empirical approaches can frame further dimensions. For example, immigration can have fiscal implications (e.g., Storesletten 2000), implications for the emigrant countries (e.g., Giuliano and Ruiz-Arranz 2009, Docquier and Rapoport 2012), and political economy implications (e.g., Tabellini 2020). Implications for inequality are also germane. In the theory developed here, immigration can not only raise workers' wages but also lower income differences between a worker and a given business owner. Embracing these dimensions in further research can help develop an increasingly full picture of migration and its effects.

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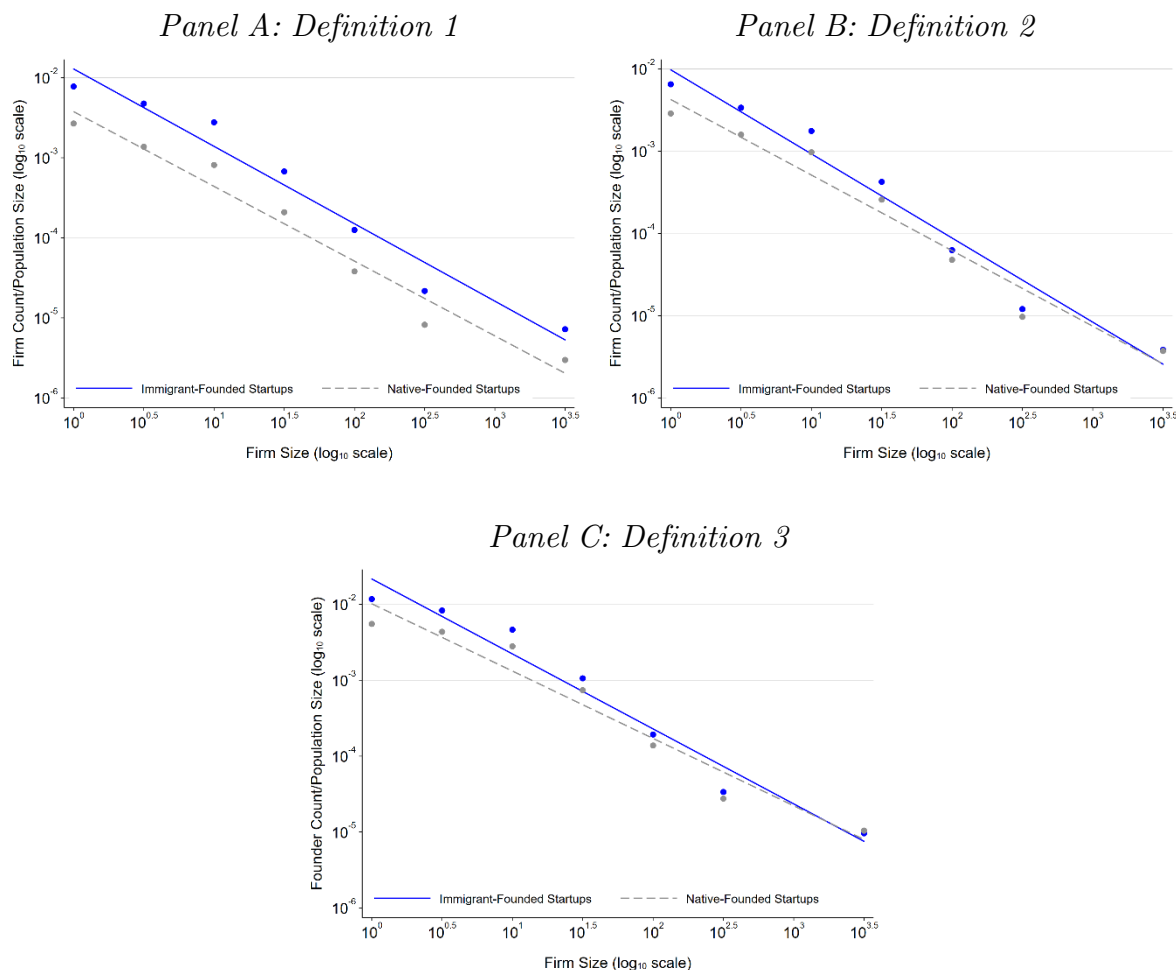


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## **Datasets**

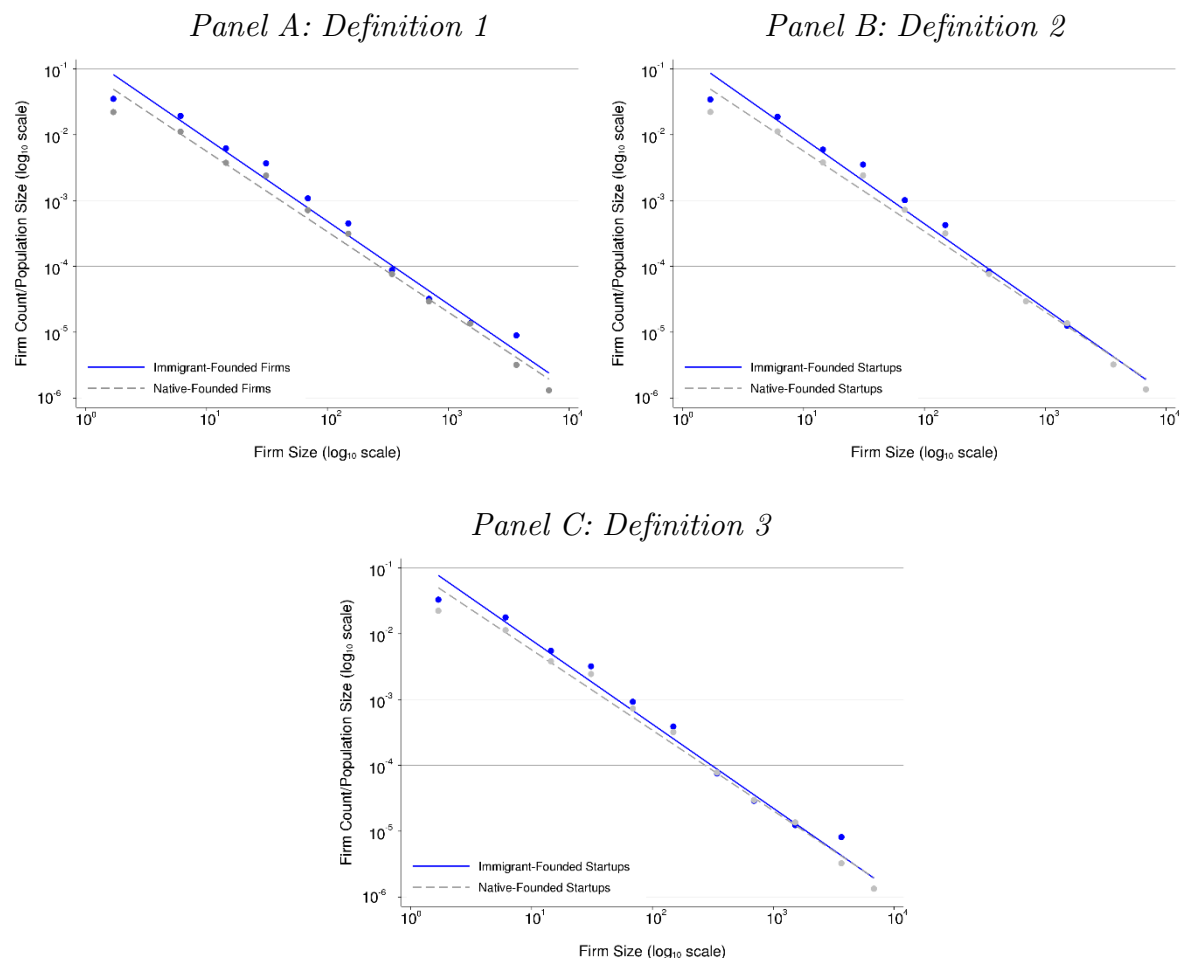
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**Figure 1**  
**Immigrant and Native-Born Entrepreneurship:**  
**Firm Size Distributions using Administrative Data**



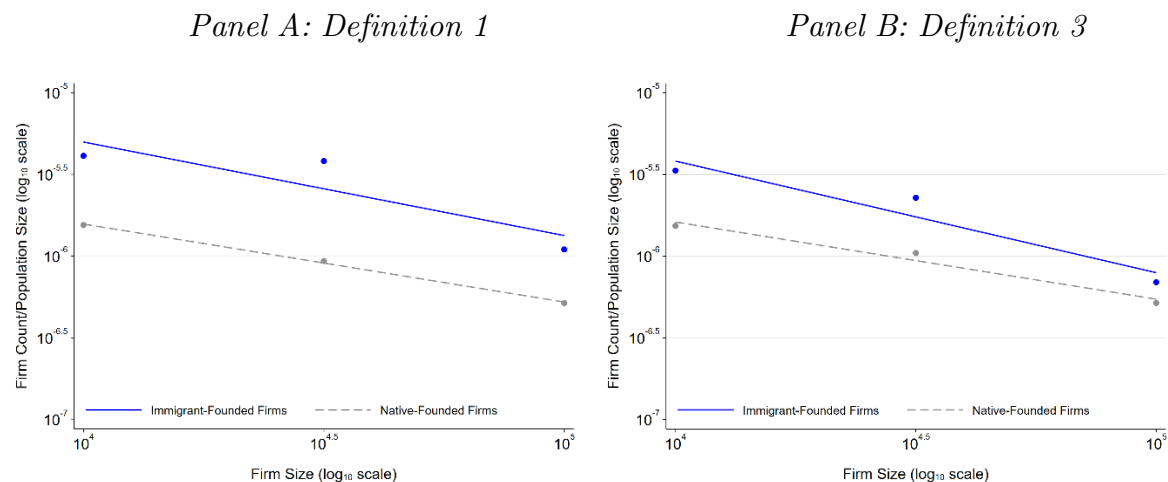
Notes: Each panel considers the firm size distribution, distinguishing between immigrant-founded and native-founded firms, for all U.S. firms in the US Census Longitudinal Business Database founded in the 2005-2010 period. Based on W-2 earnings data, founding team members are defined as individuals who are among the top three earners and join the firm in the first year of operations. The x-axis is the log of firm size measured as total employment in the firm five years after founding. The y-axis is the log count of firms of a given size, with the count normalized by the number of workers from the relevant population (immigrant or native born). The plotted measures correspond to Corollary 2. Panel A counts a firm as immigrant-founded if any of the founding team members are immigrants (Definition 1 in the text). Panel B counts a firm as immigrant-founded only if the highest paid member of the founding team is an immigrant (Definition 2). Panel C assigns firms to immigrant and non-immigrant proportionally based on the mix of immigrant and native-born individuals in the founding teams (Definition 3).

**Figure 2**  
**Immigrant and Native-Born Entrepreneurship:**  
**Firm Size Distributions using Survey of Business Owners**



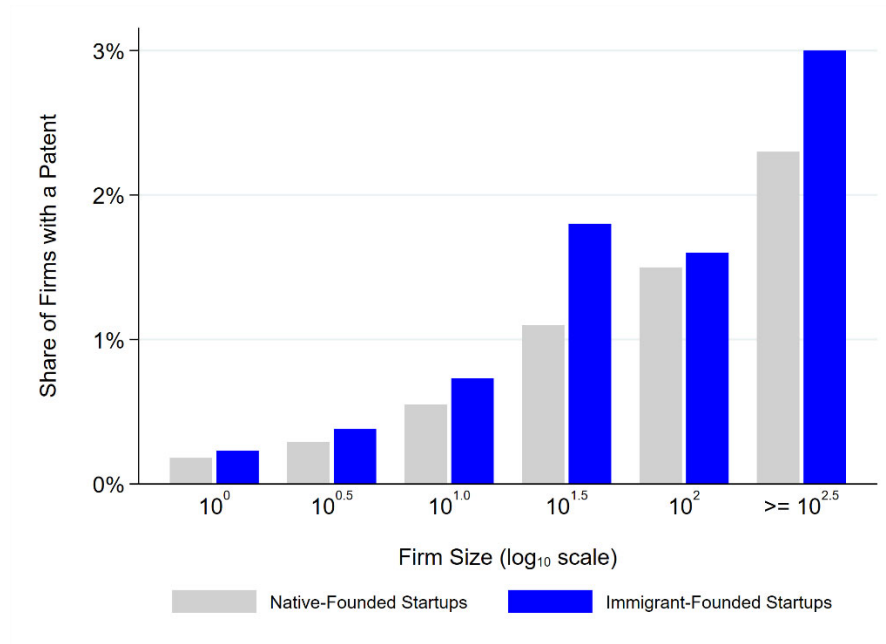
Notes: Each panel considers the firm size distribution, distinguishing between immigrant-founded and native-founded firms, using the 2012 Survey of Business Owners. The x-axis is the log of firm size measured as current total employment in the firm. The y-axis is the log count of firms of a given size, with the count normalized by the population size of the relevant group (immigrant or native born). The population measure is an average of the immigrant or native-born population size in the year of founding, weighted by the number of firms founded in that year. The plotted measures correspond to Corollary 2. Panel A counts a firm as immigrant-founded if any of the owner-founders are immigrants (Definition 1 in the text). Panel B counts a firm as immigrant-founded only if the owner-founder with the highest current ownership share is an immigrant (Definition 2). Panel C assigns firms to immigrant and non-immigrant founded proportionally based on the mix of immigrant and native-born individuals among the owner-founders (Definition 3).

**Figure 3**  
**Immigrant and Native-Born Entrepreneurship:**  
**Firm Size Distributions using the Fortune 500**



Notes: Each panel considers the firm size distribution, distinguishing between immigrant-founded and native-founded firms. The x-axis is the log of firm size measured as current total employment in the firm, using the 2017 Fortune 500. The y-axis is the log count of firms of a given size, with the count normalized by the population size for the relevant group (immigrant or native-born). The population measure is an average of the immigrant or native-born population in the decade of founding, weighted by the number of firms founded in that decade. The plotted measures correspond to Corollary 2. Panel A counts a firm as immigrant-founded if any of the founders are immigrants (Definition 1 in the text). Panel B assigns firms to immigrant and non-immigrant proportionally based on the mix of immigrant and native-born founders of the initial business (Definition 3). Definition 2 is not available for the Fortune 500, as discussed in text.

**Figure 4**  
**Technology-Based Immigrant and Native-Born Entrepreneurship**



Notes: Using W-2 and LBD data combined with patenting records from the USPTO, this figure shows the share of firms in each firm size bin that own at least one patent, distinguishing between native-founded versus immigrant-founded startups, for all firms in the US between 2005 and 2010. Immigrant-founded startups are identified using Definition 1, which equals 1 if at least one of the founders are foreign-born. Firms are grouped into six bins according to the number of employees five years after founding.

## Supplementary Online Material

### Appendix A: Data

#### U.S. Census Data

In this appendix, we describe the various data sets used in this study. Many of the data sets are Census-based products which are available to researchers through Census-approved projects and accessible through Federal Statistical Research Data Centers (FSRDC). Form W-2 data are currently accessible only by Census employees who have been granted access through approved internal projects.

**The Longitudinal Business Database (LBD).** The LBD is a panel dataset of all establishments in the U.S. with at least one paid employee (Jarmin and Miranda 2012). This dataset begins in 1976 and currently runs through 2015. The coverage includes all industries in the private non-farm sector and every state in the U.S. The LBD is sourced from administrative income and payroll filings and enhanced with other Census data sets, including the Economic Census and the Company Organization Survey. The LBD contains information on the firm size, firm age, location, payroll, legal form of entity, and other characteristics of the establishment. We define startups as *de novo* firms that have no prior activity at any of their establishments. The founding year is the year the firm first appears in the LBD. (Note that the Business Dynamics Statistics (BDS) of the Census includes young firms that are not *de novo* startups but rather can be the results of spin-outs and divestitures from existing firms, while our measure attempts to focus on true startups.)

**Form W-2.** Our annual individual earnings information are sourced from Form W-2, which is a tax form used to report income paid to employees for their services rendered. Employers are linked to the LBD based on their employer identification numbers (EIN). The W-2 database in the Census begins in 2005 and covers through 2016. Key variables in Form W-2 include income, social security taxes, and Medicare taxes.

**The Survey of Business Owners (SBO).** Information on the immigrant vs native-born nature of entrepreneurs is obtained from the 2012 Survey of Business Owners (U.S. Department of Commerce 2012). The SBO collects information about characteristics of the businesses and their owners from a representative sample of firms in the U.S. The random sample of businesses was selected from a list of all firms operating during 2012 with receipts of 1,000 dollars or more. The SBO universe was stratified by state, industry, owner characteristics, and whether the company had paid employees in 2012. Large companies were selected with certainty. The remaining universe was subjected to stratified systematic random sampling. Each firm selected into the sample was asked the percentage of ownership, gender, ethnicity, race, and veteran status for up to four persons owning the largest percentages in the business. The final sample includes over 200,000 employer businesses in the SBO. Each firm in the SBO sample is assigned a weight equal to the reciprocal of the firm's probability of selection. Certainty cases are given a weight of one. Sample weights are used in the calculation of the results reported in the paper as frequency weights to return the population totals.

**Census Numerical Identification System File (NUMIDENT).** In order to define immigrant entrepreneurs, we use foreign-born status of individuals in the NUMIDENT. This Census database is originally sourced from the Social Security Administration (SSA) applications for Social Security Numbers (Form SS-5). Other person-level characteristics are contained in the NUMIDENT including gender, ethnicity, and date of birth.

**The Patent Longitudinal Business Database Crosswalk (LPBD).** The LPBD links patents data from the U.S. Patents and Trademark Office (USPTO) to firms in the LBD (Graham et al. 2018). This database begins in 2000 and extends to 2015. Though both application and grant years of the patent are observed, only granted patents are included in this sample. Other key variables include assignee location and type.

#### Fortune 500 Data

We collected founder and founding information for the firms listed in the 2017 edition of the Fortune 500 ranking. For each firm, we capture, whenever possible, the year of incorporation, the name of the founder, and his/her country of birth. This data collection builds on earlier efforts by the New American Economy Research Fund (2011, 2018)

and the Center for American Entrepreneurship (2017).<sup>i</sup> We extend their analysis by including all founders for these firms, whether U.S.-born or immigrants.

This process is straightforward for many firms, particularly those that were founded in the recent past.<sup>ii</sup> For others, it is more challenging, since they are the offspring of many merged entities. Our approach is to walk back the genealogical tree of each firm to the earliest parent possible, and then to identify the founders of these parents.<sup>iii</sup> A firm will therefore have potentially many founders because it has multiple parents.

There are also particular cases where we do not include the firm. For some firms (particularly railroads and power utilities), there are very many mergers and it is not possible to trace the founders effectively. Further, web searches and the *Who's Who* occasionally do not enable us to ascertain the place of birth of any of the firm's original founders. If we cannot determine immigration status for any founder, the firm is dropped from the analysis. Separately, some firms listed in the Fortune 500 were not created through acts of entrepreneurship, but rather by government fiat (Fannie Mae is such an example; Delek U.S. holdings, the state-owned Israel oil company is another one). We exclude these firms from the analysis since they cannot be said to have founders in the traditional sense.<sup>iv</sup> Overall, the sample includes 449 firms and 730 founders for whom we can determine country of birth.

**Post-1970 sample.** As an additional check on the Fortune 500 analysis, we also consider firms founded since 1970. This includes 117 firms (and 223 founders with country of birth information) in the Fortune 500 ranking. We additionally focus on this time period for two reasons. First, the ability to identify founders —and to ascertain their country of birth —is greater when focusing on firms founded in the more recent past. Second, the recent subset may be most relevant to understanding links between entrepreneurship and immigration in a contemporary setting.

## Population Data

The firm size distributions and rate of entrepreneurship measures are normalized by the population size of the relevant group (U.S.-born and immigrant individuals). To ascertain these population sizes we use two different methods, depending on the data source. We also consider robustness tests.

For the administrative data, we use the underlying, complete population of W-2 workers. All individuals with W-2's in the U.S. economy are matched to Census NUMIDENT to code U.S. born and foreign-born workers. This analysis covers these populations of workers from 2005-2010 to match with the founding years we study.

For the SBO data and the Fortune 500 data, the founding years of the firms extend back over many decades. For historical population estimates, we rely on numbers contained in U.S. censuses and collated by the Migration Policy Institute.<sup>v</sup> This data provides estimates of the immigrant population for each decade from 1850-2010 and annual estimates thereafter. These data explicitly include estimates of the unauthorized immigrant population.

**Population weights.** Since the immigrant population share changes over time, and the SBO and Fortune 500 data include a wide range of founding years, we calculate a weighted population over the relevant distribution of founding years. Specifically, for the firm size distributions, in each size bin  $\times$  immigration status cell, we normalize the count of firms by the group's population. This population is the weighted averaged across the distribution of founding years of the firms in that size bin.

**Entrepreneurship Rates.** Comparing the administrative data and SBO approaches, note that rates of entrepreneurial entry have several differences in their calculation. First, there is a distinction between stocks and

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<sup>i</sup>See <https://startupsusa.org/fortune500/> and <https://research.newamericaneconomy.org/report/new-american-fortune-500-in-2018-the-entrepreneurial-legacy-of-immigrants-and-their-children/>.

<sup>ii</sup>Think for example of Hewlett-Packard: incorporated in 1939, with two founders, both native born. Or Google: incorporated in 1998, with two founders, one native-born, the other an immigrant.

<sup>iii</sup>For instance, American Airlines has two parents, Colonial Air Transport (incorporated in 1926, one native-born founder) and Robertson Aircraft Corporation (incorporated in 1921, two native-born founders).

<sup>iv</sup>A related example is that of Targa Resources. Warburg Pincus engineered a merger to create this firm in 2003, but it would be wrong to list as its founder Eric Warburg, who created the investment bank back in 1900.

<sup>v</sup>Available at <https://www.migrationpolicy.org/programs/data-hub/charts/immigrant-population-over-time>. Immigration figures for decades prior to 1970 stem from the work of Gibson and Campbell (1999).

flows. The administrative data focuses on the flow of new business over the 2005-2010 interval, while the SBO looks at the stock of businesses at a point in time. Because the interval for the administrative data is short, the flow of new business formation will show a smaller rate of founders among the overall working population, whereas the SBO measure approximates the longer-run equilibrium rate. Second, the population normalizations are different. With the administrative data, we have the entrepreneurial rate among the workforce (W-2 workers). With the SBO data, we have the entrepreneurial rate among the entire population, which is substantially bigger than the total workforce and thus pushes down the SBO rate by comparison (and in contrast to the stock vs. flow issue which amplifies the SBO rate). Third, the measurement construct is different because the SBO allows us to see the top 4 owners of the firm (in 2012) and we look at those owners who were also reported as original founders in the survey. This means that we don't see founders for old firms or firms where the founders have exited from lead ownership roles. Despite these differences, we find that the relative entry rate of immigrants and native-born individuals ( $e_1^*/e_0^*$ ) is very similar when using the administrative data or SBO data approach.

**Unauthorized immigrant population.** The census population data in each time period includes all individuals present in the U.S., regardless of citizenship or legal immigration status. In practice, demographers have long recognized that undocumented immigrants are less likely to participate in census surveys, a source of “coverage error” that is then corrected for in these population counts (Van Hook and Bachmeier 2013; Passel and Cohn 2018). Of note, disagreements regarding estimates of the undocumented immigrant population occur within a relatively narrow range.<sup>vi</sup>

While there is no obvious bias in these population estimates, one may nonetheless consider how sensitive the results in the paper could be to any under-count of the immigrant population. Specifically, how much would the underlying immigrant population need to be scaled up so that the aggregate employment in immigrant-founded firms, per immigrant in the population, decline to the equivalent measure for the native-born?

We find that the required immigrant population scaling is at least 40-60%, depending on the data set. To put this required under-count in context, estimates suggest approximately 45.6m foreign-born individuals in the U.S. in 2017, including approximately 10.5m unauthorized immigrants (Passel and Cohn 2018). Higher estimates suggest as many as 12 million unauthorized immigrants (Kamarck and Stenglein 2019). Under-counting the total immigrant population by 40-60% would mean that unauthorized immigrants total 30 million or more individuals, in comparison to standard estimates of 10.5-12 million. There is no evidence that immigration could be understated by anything close to this magnitude. Overall, immigration on net appears to be a net job creator in the U.S. economy when including unauthorized immigrants.

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<sup>vi</sup>Despite using slightly different data and assumptions, estimates from the Pew Research Fund, the Department of Homeland Security, and the Center for Migration Studies have never differed by more than 1 million people, less than 10% of the total unauthorized population.



## Appendix B: Additional Results

### Fortune 500 firms, Post 1970

As an additional view of the Fortune 500 data, Appendix Figure B1 repeats Figure 3 but now focusing on the (2017) Fortune 500 firms that are founded from 1970 onward. This subset includes 123 firms. Studying firms founded since 1970 has two advantages: The founder information is more comprehensive for this subset and the recent subset is more relevant to contemporary immigration outcomes. As can be seen, the results are similar.

### Slope Calculations

We calculate the Pareto slope parameters and their standard errors for all definitions in all figures. We follow Newman (2005) to use best practices for power law distributions, which is a maximum likelihood method<sup>vii</sup>. The slopes and their standard errors are reported in Table B2. We emphasize the SBO as this comes closest to the long-run distribution for the whole support of firm size. The slopes are extremely similar using Definitions 1, 2, or 3—varying slightly around 1.78. They are still statistically significantly different given the scale of the data. As another comparison, we also examined the power law slope in the whole LBD, and find a slope of 1.74.

### Calibration

Corollary 3 provides the basis for a calibration of the implications of immigration for economy-wide wages and per-capita income. Specifically, consider equation (9), repeated here for the wage comparative statics:

$$\frac{d \log w^*}{dn_1} = \theta \frac{a_1^\gamma - a_0^\gamma}{a_0^\gamma n_0 + a_1^\gamma n_1} \quad (10)$$

Rewriting the right hand side in ratios of the form  $(a_1/a_0)^\gamma$  and using (8), we can express the ratios in terms of relative entrepreneurial entry rates from the immigrant and native populations:

$$\frac{d \log w^*}{dn_1} = \theta \frac{e_1^*/e_0^* - 1}{[e_1^*/e_0^* - 1]n_1 + 1} \quad (11)$$

For a sufficiently fat tailed power law, where the slope is less than 2 (which we find in all data sets and founder definitions—see Table B2) the relevant case for calibration as  $a_{max}$  becomes large is  $\theta = 1 - \beta$ . Taking observed values of  $e_1^*/e_0^* = 1.8$  and  $n_1 = 0.13$  in the administrative data, and  $\beta = 2/3$  to match the labor share, we find  $\frac{d \log w^*}{dn_1} = 0.24$ , as reported in the text. By Corollary 3, the comparative static for per-capita income is the same.

### Wages in Immigrant vs. Native Founded Firms

The empirical results investigate employment and the firm size distribution for native-founded and immigrant-founded firms. The empirical analysis in turn follows our conceptual framework, where individuals have heterogeneous entrepreneurial acumen and, for simplicity, homogeneous labor.

Of additional interest may be the wages for the jobs that these founders create and how these wages compare between immigrant and native-founded firms. The administrative data, with which we have integrated the W-2 records for every individual working in these firms, provides an additional opportunity to examine wages in a systematic fashion. We run OLS regressions of the form

$$\log(w_i) = \alpha + \beta \text{ImmigrantFounded}_f + \gamma X_i + \theta Z_f + \varepsilon_i$$

where  $w_i$  is the individual worker  $i$ 's annual W-2 earnings from employer  $f$ ,  $X_i$  is a vector of the individual worker characteristics, and  $Z_f$  is a vector of the firm's characteristics. Individual worker characteristics include fixed effects for age and indicators for gender and for being foreign-born. Firm characteristics include fixed effects for founding year, fixed effects for county, and fixed effects for sector using NAICS 4-digit industry codes. Results are presented in Table B1 and are discussed in Section 5.2.

<sup>vii</sup>In particular, see equations [5] and [6], as well as Appendix B in Newman [2005].

## **Patenting**

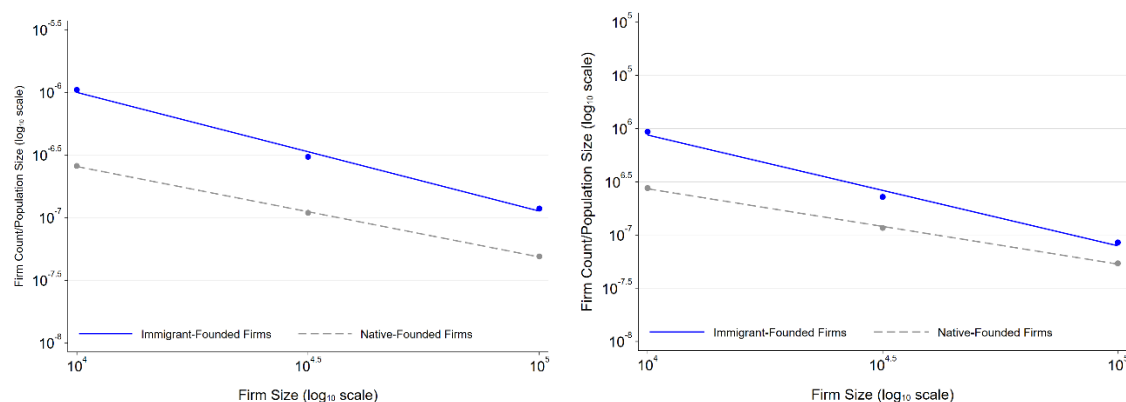
Figure 4 presents the patenting rate by firm size, comparing immigrant-founded and native-founded firms, in the administrative data. This analysis uses Definition 1 for defining immigrant firms. That is, we consider firms as immigrant-founded if at least 1 of the founders is an immigrant. Appendix Figure B2 repeats the analysis but uses Definition 2 instead. In this definition, the firm is an immigrant-founded firm only if the highest-wage individual in the founding team is an immigrant. (By construction, now the native-founded firms include some founding teams that include immigrants.) Under this definition, immigrant-founded teams still have a higher rate of patenting in each size bucket, although the difference is not as large.

## **Timing**

Studies of mass migration events in U.S. history find large and persistent long-run gains in income per-capita in regions that experienced greater immigration (Tabellini 2020, Sequeira et al. 2020). Other studies investigate shorter-run outcomes from migration events, and often do not find negative employment or wage effects. For example, Card (1990) examines the five-year period after the Mariel Boatlift. While final output demand from immigrant workers is immediate, and pushes toward neutral employment effects in general equilibrium (as in the model of Section 3), an interesting question is whether the entrepreneurial orientation appears over a short enough time period to be of relevance to shorter-run outcomes.

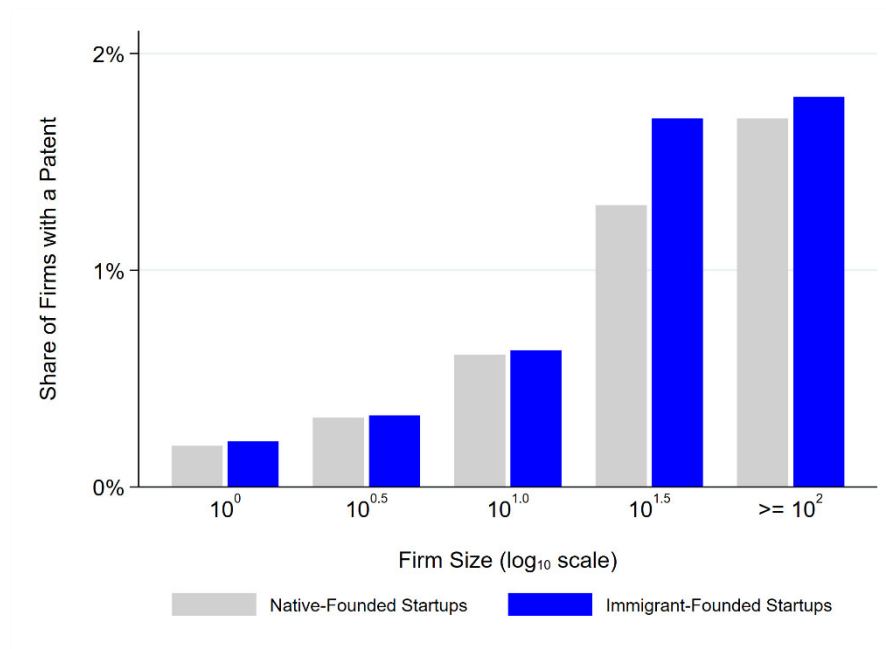
To study this question, we integrated the American Community Survey, which provides year of entry for U.S. immigrants. For this Census survey, we then focused on individuals who entered the United States in 2005, providing a ten-year window through 2015 where we can comprehensively ascertain labor force participation, wage employment, and new business creation. We find that, among the immigrants in the sample who founded a firm within ten years, roughly half did so within a window of five years, with the highest rate appearing in year 2. This indicates that new venture dynamics appear to be relevant even in the short run. We treat these findings as suggestive and leave systematic study of dynamics of labor market entry and new venture creation to future work.

**Figure B1**  
**Immigrant and Native-Born Entrepreneurship:**  
**Firm Size Distributions using the Fortune 500 firms founded post-1970**



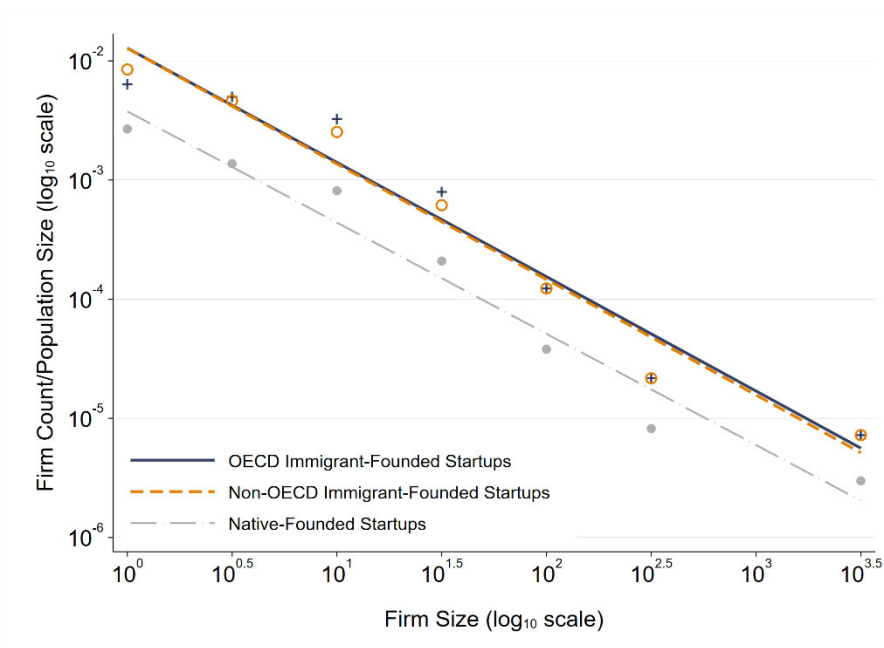
Notes: Each panel consider the firm size distribution, distinguishing between immigrant-founded and native-founded firms. The x-axis is the log of firm size measured as current total employment in the firm, using the 2017 Fortune 500. The y-axis is the log count of firms of a given size, with the count normalized by the population size for the relevant group (immigrant or native born). The population measure is an average of the immigrant or native-born population in the decade of founding, weighted by the number of firms founded in that decade. The plotted measures correspond to Corollary 2. Panel A counts a firm as immigrant-founded if any of the founders are immigrants (Definition 1 in the text). Panel B assigns firms to immigrant and non-immigrant proportionally based on the mix of immigrant and native-born founders of the initial business (Definition 3). Definition 2 is not available for the Fortune 500, as discussed in text.

**Figure B2**  
**Technology-Based Immigrant and Native-Born Entrepreneurship**  
**using Definition 2**



Notes: Using W-2 and LBD data combined with patenting records from the USPTO, this figure shows the share of firms in each firm size bin that own at least one patent, distinguishing between native-founded versus immigrant-founded startups, for all firms in the US between 2005 and 2010. Immigrant-founded startups are identified using Definition 2, which equals 1 if the highest paid founder is foreign-born. Firms are grouped into five bins along the  $x$ -axis based on the number of employees five years after founding. The difference in firm size binning relative to Figure 4 is due to Census disclosure rules requiring the minimum number of firms represented in each cell.

**Figure B3**  
**OECD-Immigrant and Non-OECD Immigrant Entrepreneurship:**  
**Firm Size Distributions using Administrative Data**



Notes: Each panel consider the firm size distribution, distinguishing between OECD immigrant-founded, non-OECD immigrant-founded, and native-founded firms, for all U.S. firms in the Longitudinal Business Database founded in the 2005-2010 period. The x-axis is the log of firm size measured as total employment in the firm five years after founding. The y-axis is the log count of firms of a given size, with the count normalized by the number of workers from the relevant population (immigrant or native born). The plotted measures correspond to Corollary 2. A firm as immigrant-founded if any of the founding team members are foreign born (Definition 1 in the text). Country of birth is used to identify OECD versus non-OECD immigrant founders.

**Table B1: Wages at Immigrant versus Native-Founded Firms**

	DV = Ln(Annual Wages)					
	(1)	(2)	(3)	(4)	(5)	(6)
Immigrant-founded firm	0.041*** (0.001)	0.045*** (0.001)	-0.000 (0.001)	-0.040*** (0.001)	0.008*** (0.001)	0.007*** (0.001)
Ln(Firm size)						-0.029*** (0.000)
Male				0.337*** (0.001)	0.245*** (0.001)	0.246*** (0.001)
Foreign born				0.082*** (0.001)	0.124*** (0.001)	0.121*** (0.001)
Constant	8.761*** (0.001)	—	—	—	—	—
Observations (Individuals)	14,640,000	14,640,000	14,640,000	14,640,000	14,640,000	14,640,000
R <sup>2</sup>	0.000	0.001	0.010	0.131	0.230	0.231
Individual Age Fixed Effects				YES	YES	YES
Founding Year Fixed Effects		YES	YES	YES	YES	YES
County Fixed Effects			YES	YES	YES	YES
NAICS-4 Fixed Effects					YES	YES

Notes: This table shows a series of OLS regressions using log annual wages as the dependent variable. Sample consists of individuals employed by startups at five years after founding, distinguishing immigrant versus native-founded firms based on Definition 1. Standard errors in parentheses are clustered at the firm level. Constants are not reported for fixed effects regressions. Note that the constant in the first specification represents the mean of log wages, rather than the log of mean wage. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$

**Table B2: Slope of Power Laws for Firm-size Distributions**

	Definition 1	Definition 2
<i>Administrative Data (5-Year Old Firms)</i>		
Immigrant Founded	1.70 (.001)	1.78 (.002)
Native Founded	1.76 (.0009)	1.72 (.008)
<i>SBO Data</i>		
Immigrant Founded	1.78 (.002)	1.78 (.005)
Native Founded	1.78 (.002)	1.78 (.005)
<i>Fortune 500</i>		
Immigrant Founded	1.35 (.036)	—
Native Founded	1.17 (.007)	—
Administrative Data (All firms in the LBD)	1.74 (.003)	

Notes: The power law slope parameter and its standard error are calculated by maximum likelihood, following Appendix B in Newman (2005). The SBO data is the most appropriate sample for comparing the long-run firm size distribution between immigrant and non-immigrant founded firms. As a reference, the slope in the overall administrative data (the LBD) in the year 1.74 is provided in the last line of the table.

## Appendix C: Proofs

### Proof of Proposition 1

This proof proceeds in two steps. First, we consider how a shift in  $f(a)$  influences the equilibrium  $a^*$ . Second, we consider how other equilibrium outcomes shift. To clarify the comparative statics, we will write  $f(a|\theta)$ , where  $\theta$  is a parameter that affects the distribution of entrepreneurial talent. In particular,  $\theta$  can be the fraction of immigrants in the economy. Equilibrium outcomes will in general be functions of  $\theta$ .

### Comparative Statics on $a^*$

To begin, we look at  $a^*$ . There are two key equations to develop the relevant comparative statics. The first equation comes from the free entry condition to entrepreneurship, defining a threshold value of entrepreneurial talent at which people start firms as opposed to being workers. This relationship is (4)

$$w = a^* (1 - \beta)^{1-\beta} \beta^\beta$$

indicating that there is a monotonically increasing relationship  $w(a^*)$ .

The second equation comes from the resource constraint, which tells us that the number of entrepreneurs ( $E$ ) and the number of workers ( $L$ ) must add up to the total number of people,  $N$ . Given the distribution  $f(a|\theta)$ , we can then write the mapping between the threshold value for founding a firm,  $a^*$ , and the number of entrepreneurs as in (5)

$$\frac{E^*}{N} = \int_{a^*}^{\infty} f(a_i|\theta) da_i$$

where we are using the fact that anyone with  $a_i \geq a^*$  will start a firm (because income as a founder then exceeds income as a worker).

Similarly, the number of workers at a given firm is  $l_i^* = \left(\frac{\beta a_i}{w}\right)^{\frac{1}{1-\beta}}$ , where  $a_i$  is the acumen of the founder. Integrating across all firms we have the total labor force  $L^*$ . We can then write that the resource constraint,  $\frac{E^*}{N} + \frac{L^*}{N} = 1$ , as

$$\int_{a^*}^{\infty} \left[ 1 + \left(\frac{\beta}{w}\right)^{\frac{1}{1-\beta}} a_i^{\frac{1}{1-\beta}} \right] f(a_i|\theta) da_i = 1 \quad (12)$$

This gives us our second function for  $w(a^*)$ . Using the entrepreneurial entry condition, (4), we can then rewrite this resource constraint to eliminate the wage and put everything in terms of  $a^*$ . Namely,

$$\int_{a^*}^{\infty} \left[ 1 + \frac{\beta}{1-\beta} \left(\frac{a_i}{a^*}\right)^{\frac{1}{1-\beta}} \right] f(a_i|\theta) da_i = 1 \quad (13)$$

To interpret this expression, note that we are counting up the number of people at each firm, which must sum to all the people in the economy. We have divided by  $N$  so we are counting people in terms of fractions of the population. The term in square brackets is the number of people associated with a given firm. The 1 in square brackets is the entrepreneur—every firm has 1 entrepreneur. The second term in square brackets,  $\frac{\beta}{1-\beta} \left(\frac{a_i}{a^*}\right)^{\frac{1}{1-\beta}}$ , is the number of workers at that firm, which is increasing in the acumen of the entrepreneur. The  $f(a_i)$  then gives the mass of the founder population associated with that firm.

The core result is then seen directly. By inspection, the term in square brackets is strictly positive. Therefore, if you increase the mass of  $f(a_i)$  for all points  $a_i > a^*$ , then the value of the integral would rise. The only way for the integral value to remain constant is therefore for  $a^*$  to rise. And if  $a^*$  rises, then the wage has to rise, per (4).

More formally, one can take the comparative statics for  $a^*(\theta)$  using Leibniz's Rule. Differentiating (13) with respect to  $\theta$ , we find that

$$a^{*'}(\theta) = \frac{1-\beta}{f(a^*(\theta)) + \frac{1}{a^*(\theta)} \frac{L^*}{N}} \int_{a^*(\theta)}^{\infty} \left[ 1 + \frac{\beta}{1-\beta} \left(\frac{a_i}{a^*(\theta)}\right)^{\frac{1}{1-\beta}} \right] \frac{df(a_i|\theta)}{d\theta} da_i$$



By inspection, the sign of  $a^{*'}(\theta)$  depends on the sign of the integral. One can then generate necessary and sufficient conditions for the comparative statics by evaluating the integral for known probability distributions and shifts in these distribution. However, since the term in square brackets is strictly positive, we can also develop simple sufficient conditions that generalize across  $f(a)$ . In particular, consider the comparative static on the share of immigrants in the economy, defined as  $\theta = n_1 = N_1/N$ . The population distribution of entrepreneurial acumen is  $f(a_i) = (1 - n_1)f_0(a_i) + n_1f_1(a_i)$  and thus

$$\frac{df(a_i|n_1)}{dn_1} = f_1(a_i) - f_0(a_i)$$

It then follows that

$$\begin{aligned} a^{*'}(n_1) &> 0 \text{ if } f_1(a_i) > f_0(a_i) \text{ for all } a_i \geq a^* \\ a^{*'}(n_1) &= 0 \text{ if } f_1(a_i) = f_0(a_i) \text{ for all } a_i \geq a^* \\ a^{*'}(n_1) &< 0 \text{ if } f_1(a_i) < f_0(a_i) \text{ for all } a_i \geq a^* \end{aligned}$$

which correspond to the three cases in the text and the first part of Proposition 1, as was to be shown.

The comparative statics on other equilibrium quantities are then as follows.

### Comparative Statics on $w^*$

From (4), the equilibrium wage  $w^*$  is monotonically increasing in  $a^*$ . Hence, the effect of increased immigration on equilibrium wages has the same sign as the comparative statics for  $a^*$ , as was to be shown.

### Comparative Statics on $Y^*/N$

From the income side, we can write GDP per capita,  $y = Y/N$ , as

$$y = \int_{a_m}^{a^*} wf(a_i)da_i + \int_{a^*}^{\infty} \pi_i f(a_i)da_i$$

Using Leibniz's rule, we have

$$\begin{aligned} \frac{\partial y}{\partial \theta} &= \frac{\partial w}{\partial \theta} \int_{a_m}^{a^*} f(a_i)da_i + w \int_{a_m}^{a^*} \frac{\partial f(a_i)}{\partial \theta} da_i + wf(a^*) \frac{\partial a^*}{\partial \theta} \\ &+ \int_{a^*}^{\infty} \frac{\partial \pi_i}{\partial \theta} f(a_i)da_i + \int_{a^*}^{\infty} \pi_i \frac{\partial f(a_i)}{\partial \theta} da_i - \pi(a^*) f(a^*) \frac{\partial a^*}{\partial \theta} \end{aligned}$$

Noting that  $w = \pi(a^*)$ , the third and sixth terms cancel. Further, the first and the fourth terms will also cancel. In particular, the first term solves as

$$\frac{\partial w}{\partial \theta} \int_{a_m}^{a^*} f(a_i)da_i = \frac{\partial w}{\partial \theta} \frac{L^*}{N}$$

For the fourth term, from the envelope theorem we have  $\frac{\partial \pi_i^*}{\partial \theta} = -l_i^* \frac{\partial w}{\partial \theta}$ . This integral thus solves as

$$\int_{a^*}^{\infty} \frac{\partial \pi_i}{\partial \theta} f(a_i)da_i = -\frac{\partial w}{\partial \theta} \frac{L^*}{N}$$

which cancels with the first integral.

The comparative statics on income per capita thus simplify to

$$\frac{\partial y}{\partial \theta} = w \int_{a_m}^{a^*} \frac{\partial f(a_i)}{\partial \theta} da_i + \int_{a^*}^{\infty} \pi_i \frac{\partial f(a_i)}{\partial \theta} da_i$$

Now, consider the case of a right shift in the distribution  $f(a_i)$ , where  $\frac{\partial f(a_i)}{\partial \theta} > 0$  for all  $a_i \geq a^*$ . Noting that  $\pi_i(a^*) = w$  and  $\pi_i > w$  for all  $a_i > a^*$ , it follows that,

$$\int_{a^*}^{\infty} \pi_i \frac{\partial f(a_i)}{\partial \theta} da_i > \int_{a^*}^{\infty} w \frac{\partial f(a_i)}{\partial \theta} da_i$$

and therefore

$$\frac{\partial y}{\partial \theta} > w \int_{a_m}^{a^*} \frac{\partial f(a_i)}{\partial \theta} da_i + w \int_{a^*}^{\infty} \frac{\partial f(a_i)}{\partial \theta} da_i = w \int_{a_m}^{\infty} \frac{\partial f(a_i)}{\partial \theta} da_i = 0$$

Thus income per-capita is increasing with a right shift in the distribution of entrepreneurial acumen, as was to be shown. Similar reasoning gives the other two cases.

### Comparative Statics on $\Pi^*/N$

The equilibrium profit rate is such that  $\Pi/Y = 1 - \beta$ . Thus comparative statics for profits per capita follow the direction as the comparative statics for income per capita, which are shown above.

### Proof of Corollary 1

Define the total number of jobs created by a given group  $j$  as  $M_j$ . This count is the total number of founders from that group,  $E_j^*$ , plus the total number of wage workers in the firms these founders create, which we define as  $L^{j*}$ . We are interested in whether  $M_j$  exceeds the population size of the group,  $N_j$ . We have

$$\begin{aligned} M_j &= E_j^* + L^{j*} = N_j \int_{a^*}^{\infty} f_j(a_i) da_i + N_j \int_{a^*}^{\infty} l_i^*(a_i) f_j(a_i) da_i. \\ &= N_j \int_{a^*}^{\infty} [1 + l_i^*(a_i)] f_j(a_i) da_i \end{aligned}$$

Comparing immigrants and the native born, we have

$$\frac{M_1}{N_1} - \frac{M_0}{N_0} = \int_{a^*}^{\infty} [1 + l_i^*(a_i)] (f_1(a_i) - f_0(a_i)) da_i$$

By inspection, the integral is zero in case 1, less than zero in case 2, and greater than zero in case 3. Taking case 3, we have  $M_1/N_1 > M_0/N_0$ . Combining this with the population constraint  $M_0 + M_1 = N_0 + N_1$  (total employment equals total population), it follows that  $M_0/N_0 < 1$  and  $M_1/N_1 > 1$  in case 3. Following this logic similarly for each case gives

$$M_1 = N_1 \text{ in case 1.}$$

$$M_1 < N_1 \text{ in case 2.}$$

$$M_1 > N_1 \text{ in case 3.}$$

as was to be shown.

### Proof of Corollary 2

The firm size distribution within a given group follows from the founder acumen distribution,  $f_j(a)$ , and the relationship between founder acumen and firm size. From profit maximization, firm size is monotonically increasing in founder acumen. Specifically, a firm's employment is

$$l_i^* = \left( \frac{\beta a_i}{w} \right)^{\frac{1}{1-\beta}} = \frac{\beta}{1-\beta} \left( \frac{a_i}{a^*} \right)^{\frac{1}{1-\beta}} \quad (14)$$

where  $a_i \geq a^*$ .

Let the firm size distribution for group  $j$  be  $g_j(l_i^*)$ . Consider the case where  $a < a_{max}$ . Using the change-in-variables rule, the firm size distribution relates to the acumen distribution as

$$g_j(l_i^*) = \left| \frac{da_i(l_i^*)}{dl_i^*} \right| f_j(a_i(l_i^*) | a_i \geq a^*) \quad (15)$$

The first term in (15) is as follows. Inverting the monotonic relationship (14), we have

$$a_i(l_i^*) = a^* \left( \frac{1-\beta}{\beta} \right)^{1-\beta} (l_i^*)^{1-\beta}. \quad (16)$$

and the slope of acumen with firm size is then

$$\frac{da_i(l_i^*)}{dl_i^*} = (1-\beta) \frac{a_i(l_i^*)}{l_i^*}. \quad (17)$$

The second term in (15) is, from (3),

$$f_j(a_i(l_i^*) | a_i \geq a^*) = \frac{1}{E_j^*/N_j} \begin{cases} \gamma_j a_j^{\gamma_j} / a_i(l_i^*)^{\gamma_j+1} & \text{if } a_j \leq a_i(l_i^*) < a_{max} \\ (a_j/a_{max})^{\gamma_j} & \text{if } a_i(l_i^*) = a_{max} \end{cases} \quad (18)$$

where  $E_j^*/N_j$  is the population share of founders – the total mass of  $f_j(a_i)$  above  $a^*$ , which is

$$\frac{E_j^*}{N_j} = \left( \frac{a_j}{a^*} \right)^{\gamma_j} \quad (19)$$

Using (16), (17), (18), and (19) in (15) produces

$$g_j(l_i^*) = \gamma_j (1-\beta) \left( \frac{1-\beta}{\beta} \right)^{1-\beta} (l_i^*)^{-\gamma_j(1-\beta)-1}$$

Taking logs and differentiating produces the slope

$$s_j = \frac{d \log g_j(l_i^*)}{d \log l_i^*} = -\gamma_j (1-\beta) - 1 \quad (20)$$

Scaling the firm size distribution by any constant produces the same power law slope in logs. Specifically, noting that the total number of entrepreneurs from this group is  $E_j^*$ , it follows that the frequency count of firms ( $c_j(l_i^*) = E_j^* g_j(l_i^*)$ ) and the frequency count normalized by the group population size ( $c_j(l_i^*)/N_j$ ) will also have this same power law slope in firm size, as was to be shown.

### Proof of Corollary 3

Consider the equilibrium rate of entrepreneurship within a given group. We have

$$e_j^* = \frac{E_j^*}{N_j} = \int_{a^*}^{\infty} f_j(a) da.$$

For the Pareto distributions, (3), with  $\gamma_j = \gamma$  this integrates as

$$e_j^* = \left( \frac{a_j}{a^*} \right)^{\gamma}.$$

It follows directly that the ratio  $e_1^*/e_0^*$  is given by (8), as was to be shown.

Now consider the equilibrium wage. From the entrepreneurial entry condition (4) the equilibrium wage is linearly related to  $a^*$ , so we will first consider comparative statics in terms of  $a^*$ .

Take the general result in (13), which is the population resource constraint expressed by adding up the workers and founders over all firms. To perform this integral, note that the joint distribution of acumen in the relevant region for the whole population is

$$f(a) = \begin{cases} \gamma a_m^{\gamma} / a^{\gamma+1} & \text{if } a^* \leq a < a_{max} \\ (a_m/a_{max})^{\gamma} & \text{if } a = a_{max} \end{cases} \quad (21)$$

where the Pareto scale parameter is  $a_m = (a_0^{\gamma} n_0 + a_1^{\gamma} n_1)^{1/\gamma}$ .<sup>viii</sup> Performing the integral (13) using this population-wide acumen distribution provides the following implicit expression for  $a^*$ .

$$1 = \left( \frac{a_m}{a^*} \right)^{\gamma} + \frac{\frac{\beta}{1-\beta}}{1-\gamma(1-\beta)} \left( \frac{a_m}{a^*} \right)^{\gamma} \left( \left( \frac{a_{max}}{a^*} \right)^{\frac{1}{1-\beta}-\gamma} - \gamma(1-\beta) \right) \quad (22)$$

<sup>viii</sup>Note that this population-wide acumen distribution makes the empirically relevant and natural assumption that there is entrepreneurial entry from both immigrants and the native-born; i.e.,  $a^* \geq a_j$  for both sub-populations.

We can then perform comparative statics that depend on how this expression behaves as  $a_{max}$  becomes large.

Case 1. If  $\gamma > \frac{1}{1-\beta}$ , then the  $a_{max}$  term disappears as  $a_{max}$  becomes large. This leads to the explicit solution for  $a^*$  where

$$a^* = a_m \left( \frac{1-\gamma}{1-\gamma(1-\beta)} \right)^{1/\gamma} \quad (23)$$

Case 2. If  $\gamma = \frac{1}{1-\beta}$ , then for any  $a_{max}$  the expression (22) becomes

$$a^* = a_m \left( \frac{1}{1-\beta} \right)^{1/\gamma} \quad (24)$$

Case 3. If  $\gamma < \frac{1}{1-\beta}$ , then the  $a_{max}$  term grows large as  $a_{max}$  becomes large. It follows in (22) that the term  $\left(\frac{a_m}{a^*}\right)^\gamma$  must go to zero. Thus for large  $a_{max}$  we can rearrange (22) as

$$a^* \approx \frac{\frac{\beta}{1-\beta}}{1-\gamma(1-\beta)} a_m^{\gamma(1-\beta)} a_{max}^{\gamma(1-\beta)-1} \quad (25)$$

Using the entrepreneurial entry condition (4) and the chain rule, we have

$$\frac{d \log w^*}{dn_1} = \frac{d \log a^*}{da_m} \frac{d \log a_m}{dn_1} \quad (26)$$

which is straightforward to compute for the three cases and the definition of  $a_m$  above, producing (9) in Corollary 3.

Finally, noting that the labor share of income is  $\beta = w^*Y^*/L$ , it follows that equilibrium GDP per capita follows the same comparative statics in  $n_1$  as the wage.

## Appendix References

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