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BEYOND WAGES: THE EFFECTS OF IMMIGRATION ON THE SCALE AND COMPOSITION OF OUTPUT

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ABSTRACT

We study potential economic benefits of immigration stemming from two factors: first, that immigrants bring not only their labor supply with them, but also their consumption demands; and second, that immigrants may have a comparative advantage in the production of ethnic goods. Using data on the universe of business establishments located in California between 1992 and 2002 matched with Census of Population data, we find some evidence that immigrant inflows boost employment in the retail sector, which is non-traded and a non-intensive user of immigrant labor. We find that immigration is associated with fewer stand-alone retail stores, and a greater number of large and in particular big-box retailers – evidence that likely contradicts a diversity-enhancing effect of immigration. On the other hand, focusing more sharply on the restaurant sector, for which we can better identify the types of products consumed by customers, the evidence indicates that immigration is associated with increased ethnic diversity of restaurants.

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I. Introduction

The share of foreign-born workers in the U.S. labor force increased from 6.5% in 1980 to 13.3% in 2007. Contemporaneous with the remarkable surge in immigration, there has arisen a controversial debate on the economic consequences of immigration – in large part focused on whether immigrants compete with natives for jobs and hence reduce wages for U.S. workers. Economic theory can be readily used to justify concerns over the effects of immigrant inflows on outcomes for natives who compete for similar jobs with immigrants. However, what is often ignored in both research and the policy debate is that immigrants do not bring to the United States only their labor supply, but also their consumption demands. Given that immigration induces both supply and demand shifts, an exclusive focus on labor supply shifts and the induced competition with native workers is too narrow and likely to overstate the negative effects of immigration. In this paper we focus on two dimensions of the economics of immigration that have received scant attention.

First, we focus on the consumption demands that accompany the labor supply shifts induced by immigration. The proportion of goods and services consumed by immigrants might be too small to affect the product demand curve for nationally-traded goods ("traded"); and goods that are traded nationally may also be traded internationally, so it is not clear that immigration necessarily shifts out the demand for these goods. However, many goods and especially services are produced and consumed locally ("non-traded"), so that immigrant influxes in a local economy can significantly shift the demand for non-traded goods and services, thus contributing to local job creation. These effects aggregate up, so that immigration should lead to employment increases in industries that produce such goods and services, thus offsetting,

at least in part, the labor supply shifts caused by immigration.[1] We refer to these as the "scale" effects of immigration. One goal of our paper is to identify and estimate these types of scale effects associated with immigration.

Second, because immigrants are consumers with potentially different demand characteristics and also may have a comparative advantage in the production of ethnic goods, their arrival may not only increase aggregate demand, but may also change the composition of products available to consumers. This effect may occur as a result of both output demand *and* labor supply shifts. For example, to the extent that immigrants have higher price elasticities of demand and/or less attachment to brands, they may increase demand for retail services from low-price chain stores. On the other hand, because of the differentiated variety of products that immigrants consume and provide, the presence of foreign-born individuals may increase the diversity of consumption choices available to natives in non-tradable services, such as restaurants, retail trade, and entertainment. Our research also attempts to quantify some of these "composition/variety" effects – which have been often mentioned in the immigration literature but hardly ever modeled or measured.

To investigate both the scale and composition effects of immigration on output, we use data from the National Establishment Time Series (NETS) database matched with Census of Population data. The NETS covers essentially all establishments, and provides detailed information on both geographical location and industry. We use NETS data for the entire state of California, mapping each business establishment in the NETS into Census tracts, and merging the NETS data with Census of Population data on the total and foreign-born population residing

[1] We are not claiming that immigration leads to aggregate job creation for natives, although local employment could be increased in immigrant-receiving areas. Rather, the point is that the output demand shifts associated with immigration can boost employment for natives and immigrants *combined*, and hence focusing only on the labor supply shifts associated with immigration can lead to overstatement of the adverse effects of immigration on native labor market outcomes.

in each tract. California is an immigrant rich area; in 2000, the state was home to one-third of all foreign-born individuals living in the United States.

Our empirical evidence is based on the relationships between immigrant inflows into local areas and a number of dimensions of change in the employment and composition of businesses in these local areas.[2] Our empirical analyses attempt to use these relationships to isolate evidence on the scale and composition effects of immigration, and to rule out other explanations of the evidence.

2. Prior research on the effects of immigration

2.1 Immigration-induced labor supply shifts

Previous research has largely focused on estimating the "partial" effects of the labor supply shocks induced by immigration. The textbook model of a competitive labor market predicts that, in the presence of a (fixed) downward-sloping labor demand curve, the shift in supply arising from an immigrant influx should unambiguously lower the real wage of native workers with whom immigrants directly compete. In addition, as long as the native labor supply curve is upward sloping, immigration should also reduce the amount of labor supplied by the native workforce. Numerous studies have tested these predictions by estimating reduced-form wage and employment equations for native workers in a given skill group as a function of influxes of immigrants with the same level of skills.

This literature has reached mixed findings, largely depending on the level of aggregation of the data used. Area analyses – which contrast the level or change in immigration by area with the level or change in outcomes for native workers – have found negative, but generally small,

[2] Strictly speaking, then, we do not measure output, but infer how output changes from changes in employment and the composition of businesses. Inferring changes in output from changes in employment clearly abstracts from changes in the labor-intensity of production, and inferring changes in output from the composition of businesses ignores variation in the scale of these businesses.

possibly insignificant effects (Altonji and Card, 1991; Card, 1990, 2001). Evidence based on across-area variation, however, can be biased against finding a negative impact of immigration on local labor markets, because natives may respond to the wage and employment impact of immigration on a local market by moving their labor or capital elsewhere.[3] In addition, immigrants might endogenously cluster in places with thriving economies, so that positive labor demand shifts may predate immigrant inflows. Using national data is therefore more appealing, but faces the challenge of finding useful sources of variation in immigrant supply shocks. Borjas (2003) recently revived this approach by defining skill groups in terms of educational attainment and work experience, in which case the variation in immigration comes from differences in immigrant inflows into various skill groups. His findings indicate that immigration reduces wages and labor supply of competing native workers.

Recent empirical literature on the labor supply shifts induced by immigration has also focused on the effects of immigration on the *average* native worker, rather than low-skill native workers, recognizing that immigrants may increase the marginal productivity of factors that are complementary in production to immigrant labor.[4] Borjas (2003) develops an empirical framework that allows estimation of the cross effects of influxes of immigrants with particular skills on the wage of natives with different skills. His results nevertheless indicate that immigration influxes to the United States between 1980 and 2000 reduced the wage of the average native worker by 3.2%. On the contrary, extending Borjas' approach to include both the

[3] While there is no available evidence on capital adjustments to immigration, the literature provides mixed findings on the displacement effects of immigration on native labor. Borjas et al. (1997) find a correlation of −1 between native net migration and immigration by state, while Card and DiNardo (2000) and Card (2001) find that inflows of immigrants with given skills into a city do not appear to contribute to out-migration of natives with similar skills. Another process of adjustment to immigration that has been investigated in the literature is the adoption of immigrant-intensive technologies (Lewis, 2005).

[4] From a theoretical point of view, general equilibrium considerations date back to Borjas' (1994) seminal survey of the economics of immigration.

adjustment of physical capital to immigration, and the possibility that immigrants and natives are imperfect substitutes, Ottaviano and Peri (2006, 2008) estimate that immigration between 1990 and 2006 had only small negative effects on average native wages in the short run (−0.4%) and small but positive effects in the long run (+0.6%).[5]

2.2 Immigration-induced demand shifts

The focus on modeling immigration exclusively as a shock to labor supply is overly narrow. Immigrants are not only workers but also consumers of goods and services, so that immigration will cause shifts in product demand. To the extent that the goods for which demand rises are produced and traded locally (as opposed to globally), product demand shifts have the potential to affect labor demand as well, and this will alleviate the adverse effects of immigration on wages and employment (Altonji and Card, 1991; Borjas, 2009). There are very few attempts, however, to empirically identify the demand-side effects of immigration – which requires the separation of immigration-induced labor demand shifts from both (i) immigration-induced labor supply shifts, and (ii) labor demand shifts that predate immigration.

Using store-level price data, Lach (2007) finds a large and significant *reduction* in prices following the unexpected arrival of a large number of immigrants from the former Soviet Union in Israel during 1990. The short-run nature of the empirical analysis – restricted to changes in prices in 1990 – limits the extent to which the negative immigration effect can be explained by declines in retail costs stemming from an outward labor supply shift.[6] If interpreted as demand-side effects, Lach's results are consistent with new consumers having higher price elasticities and lower search costs than the native population, and with composition effects (the arrival of

[5] Borjas et al. (2008) examine the estimates in Ottaviano and Peri (2006) and show that their finding of imperfect substitution between native and immigrant workers may be fragile to sample restriction and model specification choices.

[6] Moreover, immigration-induced labor supply shocks are arguably small in light of the low labor force participation of the recently-arrived immigrants.

consumers with different characteristics) offsetting the scale effects (the increase in the number of consumers). Bodvarsson et al. (2008) analyze the effects of the inflow of Cuban immigrants into Miami after the Mariel Boatlift of 1980. They find a positive and significant impact of immigrant inflows on retail sales per capita, and interpret their findings as evidence of positive consumer demand effects.[7] Finally, Bodvarsson and Van den Berg's (2006) study of Hispanic immigration to Dawson County, Nebraska – a uniquely segmented economy where immigrants work exclusively in an export sector (the meatpacking industry) but consume locally – also suggests that immigration can substantially boost consumer demand.[8]

2.3 "Diversity" and immigration

One of the commonly-cited benefits of immigration is that the *diversity* of the population is enhanced. Although diversity is often touted as a benefit in and of itself, economic models can help explain why diversity might increase welfare.[9] Lazear (2000), for example, builds a model in which the gains from diversity are greatest when groups have information sets that (i) are disjoint, (ii) are relevant to one another, and (iii) can be learned by the other group at low cost. He then empirically evaluates the argument in favor of immigration-induced diversity using the 1990 Census, and concludes that current immigration policy fails to promote diversity, while balanced immigration, promoted through the sale of immigration slots, would enrich the diversity of the U.S. population. In other analyses of the economic effects of ethnic diversity

[7] Bodvarsson et al. define a positive consumer demand effect as an increase in product prices occurring when immigration raises consumer demand. However, since they use data on sales, it is not possible in practice to decompose a positive change in sales into its components – changes in quantities sold and changes in prices. So, for a sufficiently elastic demand function, their results are also consistent with declining prices and higher quantities. But in either case product demand increases.

[8] Other recent studies of the effect of immigration on prices include Saiz (2007) and Cortes (2008), but they are less related to our study. The first focuses on immigrants' demand for housing and subsequent changes in housing rents, while the second focuses on how immigration may change the price of domestically-produced products through drops in labor costs.

[9] For an economics-oriented survey of the pros and cons of ethnic diversity, see Alesina and La Ferrara (2005).

(Ottaviano and Peri, 2006; Sparber, 2008), the gains from diversity arise from productivity effects (e.g., because of the existence of complementarities between workers of different types).

In this paper, we define and study a special case of immigration-induced diversity – namely, whether immigrant inflows increase the variety of products available for consumption. This diversity effect can arise for two reasons. First, immigrants consume and hence increase demand for "ethnic" goods. And second, they may have a comparative advantage in producing ethnic goods, hence increasing the supply of these goods. The increased diversity of goods in the product market generated by immigration may then lead to welfare improvements for natives that have relatively stronger preferences for ethnic goods.[10]

In economics, there is a well-established trade literature modeling and estimating the welfare gains from increased varieties of traded goods. Building on the seminal work of Krugman (1979) and on the methodology developed by Feenstra (1994), Broda and Weinstein (2006) model international trade within a framework of differentiated goods and estimate how the import of new varieties has contributed to national welfare gains in the United States. Using disaggregated U.S. import data, they find that U.S. consumers have low elasticities of substitution across similar goods produced in different countries, and they calculate the gain from the threefold increase in import varieties between 1972 and 2001 to be 2.6% of GDP.

The only paper of which we are aware that adapts the concept of "consumption variety" effects to the study of the economic benefits of immigration is Ottaviano and Peri (2007). They develop a general equilibrium model for a small open economy where individuals are

[10] Waldfogel (2008) presents evidence consistent with the idea that an individual consumer's welfare will be increased by the agglomeration of individuals with similar tastes in the same market. He studies the relationship between the distribution of consumer types and the distribution of restaurants, and concludes that "agglomeration of demographically similar persons brings forth private products … preferred by the agglomerating group" (p. 580). Although this research does not pertain to immigration per se, it makes the point that the entry of immigrants with similar tastes to a subgroup of natives may increase the provision of products preferred by the natives and hence increase their welfare.

differentiated in terms of origin – home-born and foreign-born – and consume two goods – a homogenous tradable good and a differentiated local non-tradable good. Individuals of different origin are assumed to be able to produce different varieties of the non-tradable good. In this setting, the non-tradable good can be thought of as a composite basket of local services whose supply particularly benefits from "ethno-cultural" diversity, such as restaurants, retail trade, and entertainment. In this paper, we build on the approach in Ottaviano and Peri (2007) and attempt to *directly* study the relationship between immigrant inflows and the composition of products available to consumers, focusing on the retail sector and the restaurant sector.[11]

3. Empirical strategies

In this section, we briefly describe our empirical strategies for studying the scale and composition/variety effects of immigration. In the following section, we explain in more detail our econometric approaches and the data that we use.

3.1 "Scale" effects of immigration on aggregate demand

Our first goal is to empirically investigate the demand-side effects of immigration. To do so, we use establishment-level data for California and study the association between employment growth in a Census tract and immigrant inflows into the same and surrounding tracts, to see whether we can detect an induced labor demand effect stemming from the outward shift in product demand associated with immigration. Detecting this effect is complicated, however, by the likely presence of two other effects that occur simultaneously. First, the outward labor supply shift associated with immigration also contributes to higher total employment. And second, immigrant inflows may themselves be a response to outward demand shifts in industries that

[11] In the model of Ottaviano and Peri (2007), it is instead *assumed* that immigration increases the ethnic diversity of some local services. When calibrating the model to conditions in the United States in the 1990, the authors specify restaurants and entertainment as the two sectors where immigration may induce ethnic diversity.

employ immigrants.

To try to identify the induced labor demand effect attributable to immigration, we estimate whether immigrant inflows are associated with increased employment in industries where neither of the other two factors – labor supply shifts or reverse causality – are likely to play a major role. First, whereas the labor supply effects of immigrant inflows into a local economy can increase output of any industry, immigrant inflows are more likely to shift the *demand* for non-traded goods and services (Altonji and Card, 1991). But simply looking at employment changes in non-traded industries to infer demand effects could be misleading if immigrant inflows tend to increase labor supply relatively more in these industries. Thus, we also distinguish – among non-traded industries – those that are relatively intensive or relatively non-intensive users of immigrant labor. The industries that are non-intensive users of immigrant labor are more likely to reveal the demand effects of immigrant inflows, rather than the labor supply effects. Similarly, because these industries use immigrant labor less intensively, a positive association between immigrant inflows and employment at the local level is less likely to reflect prior labor demand shifts driving immigration.

Figure 1 displays how the interplay between these two industry characteristics can help to identify the demand effects of immigrant inflows. The figure breaks industries into four cells based on whether the goods and services they produce are traded or not, and based on whether they are intensive users of immigrant labor. In the top row, for traded industries, there is no particular output demand shift associated with immigrant inflows, and hence there is little to be learned about the scale effects of immigration from looking at these industries. In the bottom row, for non-traded goods and services, there is an output demand shift associated with immigrant inflows. However, in those industries within this second row that use immigrant labor

– shown in the second column – there is also a labor supply shift, and the immigrant inflow may reflect past demand shifts that have some persistence. Thus, an employment increase in these latter industries that is associated with immigrant inflows need not reflect output demand shifts caused by immigration. In contrast, in the lower left-hand corner, for non-traded goods and services that do *not* intensively use immigrant labor, an increase in employment associated with immigration is more likely to reflect output demand effects because immigrant inflows are less likely to generate labor supply shifts in these industries, and it is less likely in these industries that prior demand shifts generated the immigrant inflow.

Based on Figure 1, what kind of evidence would point to output demand effects of immigration? First, we should see that immigrant inflows are associated with increased employment in non-traded industries. All else the same, the association might be *weaker* for the subset of these industries that are not intensive users of immigrant labor, but this prediction is not sharp because the effects in each industry depend on how labor supply and output demand shifts affect costs, prices, and output in the two sectors. However, a *necessary condition* for inferring that there is a scale effect on demand from immigration is that we find a positive association between immigrant inflows and employment changes in non-traded industries that are non-intensive users of immigrant labor.

Of course, we cannot classify industries *strictly* on the basis of either traded status or use of immigrant labor, in part because there is a continuum of characteristics, and in part because these characteristics are not immutable. For example, an industry that is non-intensive in immigrant labor can still absorb immigrant labor.[12] As a consequence, we cannot definitively assert that for the industries in the lower-left corner of Figure 1 there is no positive labor supply

[12] And similarly, identifying the demand effects of immigration by focusing on non-tradable sectors implies that we are estimating a lower bound for these effects, since demand may shift out not only locally.

shock from an inflow of immigrant labor. In addition, even if industries remain non-intensive users of immigrant labor, the inflow of immigrant labor into other industries can lead to an exodus of native labor from those industries, boosting employment in the industries in the lower left-hand corner of Figure 1.[13] For both of these reasons, we characterize a positive effect of immigrant inflows on non-traded, non-immigrant intensive industries as only a necessary condition for inferring a scale effect of immigration. As such, our empirical analysis of this question is suggestive at best.

3.2 "Composition/variety" effects of immigration

We explore the "composition" effects of immigration by studying the association between local immigrant inflows and the "diversity" of the retail businesses located in a given area. Note that in this case we are not concerned with abstracting from the effects of labor supply shifts induced by immigration, as these shifts may play a role in increasing the diversity of consumption choices under the likely assumption that immigrants have a comparative advantage at producing "ethnic" goods.

We look at this question along a number of dimensions. First, for retail stores, we examine how immigrant inflows are associated with changes in the numbers of chain versus stand-alone establishments, as well as establishments of different sizes. The idea behind this analysis is that a larger number of small and especially stand-alone establishments – in contrast to large and/or chain stores – may be associated with increased diversity of consumption choices. Immigrant inflows might lead to a proliferation of small or stand-alone establishments to cater to their specific tastes that might not be met by the larger, chain stores. On the other hand, if immigrants have greater price elasticities of demand (consistent with Lach, 2007), or if they tend

[13] There is a recent literature documenting comparative advantages between immigrants and natives (Patel and Vella, 2007; Amuedo-Dorantes and de la Rica, 2008; Peri and Sparber, forthcoming); this literature emphasizes occupational rather than industrial specialization.

to consume the products in which the large chain stores specialize, their arrival could shift the composition of businesses in the opposite direction.

We then take this analysis in a more narrow direction but one that we think more definitively identifies the effects of immigration on the diversity of consumption choices. Specifically, we examine whether immigrant inflows – and in particular increases in ethnic diversity in the population – are associated with a higher share of ethnic restaurants and greater diversity of the ethnicity of restaurants in the local market.

Of course, the mere presence of ethnically-diverse restaurants does not mean that natives are better off. Although we do not attempt to estimate the actual welfare gains from diversity, a prerequisite for such gains would have to be that natives consume from the ethnic establishments that get created. Casual observation suggests that the clientele of ethnic restaurants is not limited to co-ethnics. And in fact a limited amount of research documents this. Liu and Jang (forthcoming) collected data on customers of Chinese restaurants in a Midwestern U.S. city, and found that 60.2% were Caucasian, while 32.0% were Asian. Josiam and Monteiro (2004) surveyed patrons of Indian restaurants in Minneapolis/St. Paul. Among their respondents, 75% were classified as white American, and 12% as South Asian.

Our analysis is based on detailed ethnic classifications of restaurants, and characterizations of variety based on Herfindahl-Hirschman indexes. Although the focus on restaurants is narrow, the advantage of looking at this sector is that we know what types of goods a restaurant's consumers are purchasing. In contrast, although we suggested above that growth of large chain stores at the expense of small retailers implies less diversity in consumption, chain stores, in principle, could offer a variety of ethnic goods – although casual observation suggests that their offerings are in fact quite homogenous.

4. Data and econometric analysis

4.1 Data on employment and business establishment composition

Our dependent variables are constructed using data from the National Establishment Time Series (NETS) database. The NETS is a longitudinal file created by Walls & Associates using Dun and Bradstreet (D&B) data, which covers all business establishments in the United States between 1989 and 2004.[14] The NETS database does not contain a rich set of information about each establishment, but it does include the business name, a unique D&B establishment identifier (the DUNS number), the establishment location, both SIC and NAICS industrial codes in each year, the identifier of the firm's headquarters, and employment (as well as sales, which we do not use because it is usually imputed) in each year.[15]

The unit of observation in the NETS is a business establishment, which is a business or industrial unit at a single physical location that produces or distributes goods or provides services – for example, a single store or factory. Using the headquarters' DUNS number, we are able to assess whether an establishment is a stand-alone firm or a branch of a multi-establishment firm. The data in the NETS do not come from a single survey. Rather, D&B collects the underlying data through a massive data collection effort covering many sources, including over 100 million telephone calls to businesses each year, as well as obtaining information from legal and court filings, newspapers and electronic news services, public utilities, all U.S. secretaries of state,

[14] For more information about the NETS and comparisons to other data sources, see http://www.youreconomy.org/nets/NETSDatabaseDescription.pdf (viewed December 17, 2008).

[15] The exact meaning of employment in the NETS data is somewhat different from what is used by the Bureau of Labor Statistics. The BLS usually defines a firm's (or establishment's) employment as the number of employees on payroll on a particular date. In contrast, D&B continuously collects employment information throughout the year. The interviewer/online questionnaire asks a broad question: "How many persons are employed at your establishment?" No particular date is specified in the question and it does not distinguish between full-time and part-time employees. D&B's employment number also includes the owner of the business, whereas other sources capture employees only. The annual NETS Database is constructed using January snapshots of the D&B data – i.e., the data as of January of each year.

government registries and licensing data, payment and collections information, company filings and news reports, and the U.S. Postal Service.[16]

The NETS has unique advantages for the purposes of this study. First, through geocoding of business establishments' addresses, we can map employment at the detailed geographic level; in our case, we do this at the level of the Census tract.[17] Second, the NETS is designed to capture the universe rather than a sample of establishments, and hence covers essentially all firms and establishments. Third, unlike other sources of data on individual business establishments available through the Census Bureau or the Bureau of Labor Statistics, the NETS data are not confidential. We are therefore able to identify specific businesses both in our own work with the data, and in the reporting of results; both of these uses of specific business names turn out to be important in the ensuing analysis.[18] On the other hand, one limitation is that the NETS includes no information on the composition of employment with respect to skill, immigrant status, or any other dimension.

We use an extract of the NETS data that covers all business establishments that were ever located in California between 1992 and 2002.[19] Although the data extend back to 1989, the data prior to 1992 are less reliable because only beginning in 1992 was D&B able to purchase Yellow Page information on business units. We therefore use data beginning in 1992. Given that the

[16] The NETS data construction effort – including both the cross-sectional files and the longitudinal linking that tracks establishments over time – is a massive and complicated one. Details are provided in Neumark et al. (2007).

[17] The establishment locations were mapped to Census tracts with GIS software using the Census 2000 TIGER/Line files as our data source (downloaded from www.esri.com/data). The NETS contains the street address of each business establishment, but GIS mapping requires that these addresses be "geocoded" to latitude-longitude coordinates. We used a geocoded version of the NETS data that was constructed for another research project (Neumark and Kolko, 2008).

[18] We use company names to identify certain big-box retailers (Section 4.4.1), and to refine the classification of restaurants of foreign ethnicity (Section 4.4.2 and Table A2).

[19] We only had access to the geocoded NETS data for California for this research. The results might not generalize to other states, especially those in which immigrant inflows are much smaller relative to the population.

Census of Population data that we use to measure immigrant inflows (discussed next) span a 10-year window, using 2002 as the ending year for our analysis makes sense. Moreover, the finding in Neumark et al. (2007) – that the NETS sometimes detects business births with a lag – implies that using a 10-year window that is shifted forward by a couple of years relative to the Census may provide more accurate measurement of changes in employment and the number and types of businesses associated with immigrant inflows. Census-tract level summary statistics of the variables used in the analysis are reported in Appendix Table A1.

4.2 Data on total and foreign-born population

Figures on total and foreign-born population by Census tract are from the 1990 and 2000 Censuses of Population. One question is how to define the size of the market in which to measure the immigrant inflows that may either boost demand or influence the diversity of consumption choices. We can identify immigrant inflows from the Census data at the Census tract level. Two extreme choices would be to consider the data at the Census tract level, or instead to aggregate up to the metropolitan statistical area (MSA).[20] However, neither Census tracts nor MSA's seem to provide the right level of aggregation to identify the potential pool of

[20] When first delineated, Census tracts are designed to be relatively homogenous with respect to population characteristics, economic status, and living conditions. The spatial size of Census tracts varies widely depending on the density of the settlement. In California there are 7,049 Census tracts, with an average population of 4,200 in 1990 and 4,800 in 2000. MSA's include counties that center on an urban core and are characterized by a high degree of social and economic integration (as measured by commuting to work) with the core. There are 25 MSA's in California, ranging from highly densely populated metro-areas as Los Angeles-Long Beach (including 2,054 tracts) to more sparsely populated areas as Merced (including 47 tracts). The analyses reported in this paper exclude the 242 tracts located outside any MSA, which are located along the sparsely populated northern and eastern borders of the State.

Because Census geography changes over time, we must normalize 1990 and 2000 Census tract geographic definitions. Our primary data source is the Neighborhood Change Database (NCDB), which provides total and foreign-born population counts from each Census year for each year-2000 Census tract, mapping the earlier data onto the current boundaries. In the analyses of the restaurant sector we also need figures on foreign-born population from different countries, which are not available in the NCDB. In this case, we use data from the Census Summary Files (SF4), and employ Census Bureau reports of tract level allocation factors to map 1990 tract variables to 2000 geography. We would like to thank Justin Marion and Nathaniel Baum-Snow for sharing their computer code on how to implement this procedure.

customers for establishments located in a given tract: the former tend to be too small and also vary widely in size; the latter may be too large. And both are based on arbitrary boundaries that are likely to be crossed on a daily basis by residents, especially for Census tracts in densely-populated areas and along borders shared by MSA's.

To circumvent these problems, we define the pool of potential customers for an establishment located in tract c in year t as the weighted sum of the population in tracts k ($k = 1, \ldots, K_c$) located in area *a(c)* – an area that encompasses but is larger than c, and is not arbitrarily restricted to MSA boundaries:

$$(1) \qquad Pop_{a(c)t} = \Sigma_{k \in a(c)} \{ w_{ck} \cdot Pop_{kt} \},$$

where the weights w_{ck} are functions of the distance between the center of tract c and the center of tract k, which we denote $d_{c,k}$.[21] Assuming that the likelihood that consumers shop in tract c decreases with the distance between c and the tract where they live, we could simply specify w_{ck} as some decreasing function of $d_{c,k}$. Rather than arbitrarily assuming some function declining in distance, we define weights based on the distances consumers travel.

In particular, using data from the 2001 National Household Travel Survey (NHTS), we calculate summary statistics on the number of miles that Californians travel to go shopping. Figure 2 shows smoothed distributions of shopping trips by miles traveled, separately for residents in the MSA's of Los Angeles, Orange County and Riverside (Panel A), and for residents in the remainder of the urbanized areas of California (Panel B).[22] We group trips shorter than 5 miles into 1-mile-length bins, trips between 5 and 30 miles into 5-mile-length bins, and trips between 30 and 50 miles into one residual bin. We let δ index these 11 distance bins,

[21] In practice, the center of a tract is defined by its geometric center, or "centroid." Spherical coordinates of Census 2000 tract centroids were downloaded from the U.S. Census Bureau (http://www.census.gov/geo/www/gazetteer/places2k.html) and converted to planar coordinates using ArcGIS software.

[22] We do not disaggregate further because the sample is small.

and denote by p_δ the proportions of shopping trips in each bin. These proportions are graphed in Figure 2 (piecewise line). For each tract c, we then calculate the number of tracts that are δ-miles away from c ($T_{c\delta}$), and set the weights in equation (1) equal to:

$$(2) \qquad w_{ck} = \begin{cases} \dfrac{p_\delta}{T_{c\delta}} & if\ d_{c,k} \in \delta \\ 0 & if\ d_{c,k} > 50 \end{cases}$$

where the values of p_δ vary depending on whether tract c is in Los Angeles, Orange County-Riverside, or elsewhere in the state, based on the two panels in Figure 2.[23]

Since we have argued that the composition/variety effects of immigration may arise not only from immigrants' consumption choices, but also from their labor supply, in some of our analyses of these latter effects we also define weights that map the distribution of miles traveled by Californians to commute to work. In practice, these weights are constructed as in (2), where the p_δ's represent the proportions of work trips of different length (piecewise lines in Figure 3). A comparison of Figures 2 and 3 reveals that individuals tend to travel longer distances to go to work than to go shopping.

4.3 Econometric analysis of the scale effects of immigration

To explore the scale effects of immigration on demand, we begin with a statistical model that relates employment in establishments in industry groupings (indexed by i) located in a given Census tract to the population of potential consumers residing in the same and surrounding tracts:

[23] The idea behind dividing by $T_{c\delta}$ is the following. Suppose that tract c is distance d from tract k, and the travel data imply that the proportion p of the trips of those residing in tract k cover distance d. Residents of tract k can travel in multiple directions, and we would not expect all those traveling distance d to travel to tract c. Instead, we count the number of tracts that are distance d from tract c, which we denote T, and assume that $1/T$ of those who travel distance d will travel to tract c. In principle one could try to refine this by taking account of roads and other travel infrastructure.

(3) $logE_{ict} = \alpha_i + \beta_i \, logPop_{a(c)t} + \mu_{ic} + \mu_{it} + u_{ict}$,

where E_{ict} is the employment in establishments located in Census tract c in year t, and the μ's are tract and year fixed effects. In practice, we run separate regressions for different sets of industries. To eliminate the Census tract fixed effects, which capture time-invariant characteristics of local areas that may be correlated with both differential employment opportunities and populations, we exploit the panel structure of the data and form the first-differenced equation using our two observations on each Census tract:

(4) $\Delta logE_{ic} = \eta_i + \beta_i \, \Delta logPop_{a(c)} + \nu_{ic}$.[24]

In equation (4), immigration contributes to the change in population: as immigrants flow into an area, the number of consumers increases and this may affect employment, through the increase in product and induced labor demand, as well as through the withdrawal of natives from the labor force. Note that identification in equation (4) comes from employment and population changes within tracts (or aggregation of tracts) over time.

In order to allow different effects of changes in the native and immigrant populations (N and I, respectively), we can rewrite equation (3), ignoring subscripts, as $logE = \alpha + \beta log\,(N + \theta I) + u$, which can be transformed into $logE = \alpha + \beta \, logN + \lambda(I/N) + u$, using the approximation $log(N + \theta I) = log\,(N[1 + \theta I/N]) \approx log\, N + \theta I/N$, and setting $\lambda \equiv \beta\theta$. We also estimate this last specification in differences, which yields:

(5) $\Delta logE_{ict} = \eta_i + \beta_i \, \Delta log\, N_{a(c)} + \lambda_i \, \Delta\,(I/N)_{a(c)} + \eta_{ic}$.

where $\lambda \neq \beta$ (that is, $\theta \neq 1$) would suggest that the scale effects on demand differ between natives and immigrants.

As discussed in Section 3.1, it is the distinctions between sectors that are tradable or not,

[24] η_i is the difference in year effects for industry i between the two years over which we difference.

and that are more or less intensive in their use of immigrant labor, which allow us to identify segments of the economy where a positive association between employment growth and immigrant inflows is more likely to reflect demand-side effects induced by immigration. To implement this approach, we have to classify industries along two dimensions: non-traded versus traded; and the intensiveness of use of immigrant labor.

For the first classification, we would ideally categorize industries on the basis of estimates of the fraction of output that is non-traded. Since these estimates are not easily obtained, we have to rely on a standard, but somewhat arbitrary, classification of industries. Services have traditionally been classified as non-tradable industries. More broadly, this is arguably an appropriate definition for retail trade, construction, educational services, health care, social assistance, food services, repair and maintenance, personal and laundry services, and private household services – and in what follows we will refer to this set of industries as *non-tradable* (NT). Industries including transportation, warehousing, accommodation services, and public administration, as well as information, and finance, insurance, and professional services, may more often serve a larger population than local residents (Kletzer and Jensen, forthcoming), while agriculture, mining, manufacturing, utilities, and wholesale trade are more easily classified strictly as traded sectors (TR).

With regard to immigrant intensiveness, we use information on the existing sizable differences in the likelihood of employment of foreign-born individuals across industries. As shown in Table 1, in 2000, foreign-born individuals made up around 31% of the total labor force in California. However, foreign-born shares in the labor force of (NAICS) 2-digit industries were as high as 65% in agriculture and as low as 12% in mining – both industries that we classify as strictly tradable. Notably, all of the other strictly tradable industries – that is, the manufacturing

sub-industries and wholesale trade – have higher-than-average intensity in the use of immigrant labor. On the contrary, among non-tradable industries, some are more immigrant-intensive (accommodation and food services; repair, personal, and household services; construction), and others are less so (retail trade; health care and social assistance; educational services). As argued earlier, it is in these last three sectors (which we would place in the lower left-hand corner of Figure 1) that an increase in employment associated with immigration can be taken as more likely to reflect output demand effects, and less likely to be contaminated by labor supply shifts or reverse causality. Both the case of education and health services, however, may be less informative regarding the scale effects of population growth on demand to the extent that an increase in utilization of these services does not necessarily translate into an increase in employment. The study of these two sectors is nevertheless of interest in light of the debate on whether immigration puts strain on schools, hospitals, and other public services.

Table 2 reports the first-differenced relationship between employment growth in a Census tract and the growth in the population residing in that tract and surrounding tracts. The dependent variable is the 1992-2002 change in the logarithm of the number of employees in NETS establishments in a given industry or set of industries in tract *c*. Panel A reports estimates of equation (4), and Panel B of equation (5). Population growth is calculated as the 1990-2000 change in the logarithm of the weighted population in tract *c* and surrounding tracts, where the weights are defined as in (2). Likewise, the change in the ratio of immigrants to natives is calculated as the 1990-2000 change in the ratio of the weighted foreign-born population and the weighted native population. Different columns correspond to different industry restrictions. Given the uneven size of different tracts and industries, regressions are weighted by the number of employees in tract *c* and industry *i* in 1992. Standard errors are clustered at the MSA level to

correct for heteroscedasticity and arbitrary correlation across tracts located in the same MSA.[25]

As shown in column 1, Panel A, a 1% increase in population is associated on average with a statistically significant 1.2% increase in employment when looking at all industries. By focusing on non-tradable industries instead of all industries, we can better isolate the association due to the changed demand that the increasing population may cause for such goods and services. As shown in column 2, the estimate is quite similar. Columns 3 through 6 further restrict the set of industries considered, to those that make below-average use of immigrant labor – retail, education, and health services – first in combination, and then separately. In each case, we find approximately a 1-to-1 relationship between employment and population changes.

To focus more sharply on immigration, Panel B separately estimates the contribution to employment growth of immigrant and native population growth. As shown above, total population growth can be approximated by the sum of the growth in the native population and the change in the ratio of immigrants to natives. Across the columns of Panel B, the estimated relationship between employment growth and native population growth is very similar to Panel A. On the contrary, the association between employment growth and the change in the ratio of immigrants to natives is generally smaller – not only overall, but also in non-traded industries (column 2) and more so for those that are non-immigrant intensive (column 3). However, when disaggregating the analysis further across the specific non-traded, non-immigrant intensive sectors, we find considerable heterogeneity. In the retail sector, the contribution of immigrant population growth to employment growth is positive and significant (column 4); the estimated effects are consistent with the existence of immigration-induced scale effects on demand for

[25] The estimation results presented in the paper are robust to both running unweighted regressions and clustering the standard errors at a higher level – that is, across the 17 Consolidated Metropolitan Areas in California.

retail that are as nearly as large as the effects arising from native population growth.[26] On the contrary, only for educational services and health is the contribution of immigration neither economically nor statistically significant.

The findings for these last two sectors could be consistent with congestion and overcrowding of schools and hospitals following immigration, assuming that demand increases but employment does not. However, since we estimate large and positive employment effects associated with native population growth, the findings seem more likely to reflect lower utilization of these services by foreign-born individuals. In the case of health care services, this could stem from the lower average age of adult immigrants or from positive selection, both of which would predict better health status among immigrants than natives.[27] In the case of educational services, lower utilization by foreign-born individuals may mechanically stem from the lower share of the foreign-born population that is less than 16 years old.[28]

We turn next to the relationships between changes in population and changes in the number of establishments in different sectors. The latter is just another indicator of the change in economic activity, but if we get different results than for employment it could tell us something about changes in the composition of businesses, which we will explore more fully when we turn to the question of composition effects. Table 3 presents estimation results from the same specifications used in Table 2, except that the dependent variable is the 1992-2002 change in the

[26] Notice that λ, the coefficient of I/N, is equal to $\beta\theta$. The last two rows of Table 2 report the F-statistics and the p-values for testing the hypothesis that $\lambda = \beta$ (that is, $\theta = 1$); the hypothesis is not rejected in the case of the retail sector.

[27] In 2000 Census data for California, the share of prime age individuals (25-44 years old) was 49% among the adult foreign-born population, but only 37% among natives. On the contrary, the shares over 65 were, respectively, 10% and 17%.

[28] In 2000, 32% of the native population residing in California was below 16, versus less than 10% among the foreign-born. Of course, many children of immigrants are U.S.-born, raising the issue of whether to consider them as part of the immigrant population. In our analysis, immigrants are identified exclusively as foreign-born individuals, so we do expect lower utilization of educational services by this group.

logarithm of the number of establishments. The regression estimates are now weighted by the number of establishments in tract *c* and industry *i* in 1992. The estimated relationship between growth in the number of establishments and population growth is positive, both in the overall economy and in non-traded sectors (Panel A). Interestingly, though, as shown in Panel B, the association between growth in the foreign-born population and growth in the number of establishments is not statistically significant in any of the non-traded sectors that are not immigrant intensive, including the retail sector. The contrast with the results for employment in retail suggests that immigration may affect the composition of business establishments.

4.4 Econometric analysis of the composition/diversity effects of immigration

We now turn to evidence on the effects of immigration on the variety of consumption choices available to natives. We estimate models that relate measures of the composition of business establishments to measures of the composition of the population by nativity. Our interest in this analysis is in how immigration affects the consumption options of residents of a particular Census tract. Because these residents may travel to surrounding tracts when they shop or go out to eat, and because the consumption choices in these surrounding tracts (as well as their own tract) are likely, in general, to be shaped by the role of immigrants as *consumers*, in this analysis both the dependent and independent variables are defined as aggregates of tracts that correspond to the shopping area centered on a given tract of residence *c*, using the weights defined in equation (2). We therefore estimate equations of the form:

$$(6) \qquad \Delta logEstab^{typeK}\_share_{a(c)} = \eta_i + \delta \Delta log(I/Pop)_{a(c)} + \phi \Delta logPop_{a(c)} + \xi_{a(c)}.$$

The coefficient δ captures the potential effect of the immigrant share of the population on the composition of businesses. Since size per se arguably leads to more diversity,[29] the equation

[29] For example, in Krugman (1979) growth in the labor force (which may stem from immigration, as well

also controls for changes in the population. Because the equation is estimated in first-differences, the estimates are not influenced by time-series relationships between structural changes in the economy – such as the advent of big box retailing – and immigration.

When we turn to the narrower analysis of restaurants, the consumption choices available to natives may also be shaped by the role of immigrants as *workers*, because immigrants may have a comparative advantage in the production of ethnic goods. In this analysis, therefore, we also estimate equations where the immigrant share of the population is defined in area *a(c)* centered on *c*, but defined using weights that map the distribution of commuting-to-work trips, rather than the distribution of shopping trips.

4.4.1 Retail stores

We focus first on the retail sector.[30] Table 4 looks at changes in the share or number of stores by size of the business, using three size categories: stores with fewer than 10, 10 to 99, and 100 or more employees. As shown in Panel A, growth in the share of the foreign-born population is associated with a decline in the share of very small retail establishments and increases in the shares of both medium-sized and large stores (although the latter effect is not statistically significant). As shown in Panel B, this compositional change stems primarily from a drop in the *number* of small stores. The estimates imply that a 10% increase in the share of the foreign-born population is associated with a 4% drop in the number of small establishments.

As suggested earlier, a decreasing share or number of small retail establishments may be associated with less diverse consumption choices. This argument is more likely to hold for products such as food, clothes, or other consumption goods such as decorations and gifts, but is

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as from other changes) increases varieties available in the market solely because of economies of scale in production.

[30] Unless otherwise noted, the analysis presented in this section is restricted to establishments with NAICS two-digit codes 44 and 45 (retail trade).

less relevant for items such as auto parts, hardware, or electronics – because the latter are more likely to be uniform across stores of different sizes, and at any rate unlikely to display variation in the "ethnicity" of goods. We therefore next restrict the analysis to the subset of the retail sector in which it is more likely that more small stores implies greater diversity (possibly along ethnic lines); we define this subset to include grocery, clothing and general merchandise stores, as well as a series of miscellaneous stores that specialize in items such as art supplies, posters, coins, decorations, or collectibles. As shown in columns 4 through 6, in this case, also, growth in the share of the foreign-born population is associated with a drop in both the number and share of very small retail stores.

In the next two tables we look at the same question but characterizing the composition of retail stores differently. In Table 5 we study the differential growth in small businesses, identified on the basis of the number of establishments in California with the same DUNS headquarter number. First, we identify stand-alone stores as those with no other establishments in California with the same DUNS headquarter number. We find that an increasing share of immigrants in the population is associated with both smaller shares of and fewer stand-alone stores (columns 1 and 3). We find similar results when extending the analysis to a more broadly-defined group of small businesses – including not only stand-alone stores but also small chains, which are identified as stores for which no more than 9 other stores share the same DUNS headquarter number (columns 2 and 4). As it turns out, though, these findings are driven by the stand-alone stores; when we run the analysis separately for small chains but excluding the stand-alone stores (columns 3 and 6), we find that an increasing share of immigrants in the population is associated with a larger share of stores in small chains (and no effect on the number of such stores). Thus, the sharpest result is that an increasing immigrant share is associated with declines

in stand-alone retail stores.

In Table 6, we look instead at large chains. Specifically, we exploit the non-confidentiality of the NETS data to examine effects of immigrant inflows on particularly large and well-known big-box retailers. Columns 1 and 2 use a narrow list, including Wal-Mart, Kmart, Costco, Target, Lowe's and Sears, while in columns 3 and 4 the list is expanded to also include Best Buy, Home Depot, Staples, Office Depot, Circuit City, and Fry's. In 1992, there was on average one big-box retailer from the short list for every 13 Census tracts, and one big-box retailer from the long list for every 9 tracts. For the two definitions, the average change in the number of big-box stores between 1992 and 2002 is one more store for every 23 tracts (short list) or 9 tracts (long list). Most of the establishments that belong to these chains are reported to belong to the retail sector, but there are some cases in which the sector of activity is wholesale trade (on average, fewer than 10%). In columns 1 and 3 we consider all establishments belonging to each chain, and in columns 2 and 4 we restrict attention to the retail stores only, as in the preceding analyses in this section.

For these different definitions, we regress the change in the number of big-box retailer establishments on the change in the share of the foreign-born population and the change in the log total population.[31] The estimates indicate that increases in the immigrant share are associated with more big-box retail establishments. In particular, the estimates in columns 2 and 4 imply that a 10-percentage point increase in the foreign-born population (which is the standard deviation of the foreign-born share across tracts) is associated with one more big-box store from the short list for every 59 tracts, and one more big-box store from the long list every 40 tracts. As shown in Panel B, increases in the share foreign-born are also associated with increases in the

[31] Note that in this case, because of the large number of tracts with no big-box outlets, the dependent variable is the change in levels rather than the change in logs.

number of big-box retailers as a fraction of all retail establishments, although the estimate is significant only for the longer list of big-box chains.

A potential issue in interpreting the estimates of the coefficients on the change in the foreign-born share of the population in this last analysis is the endogenous location of immigrants. Despite using first differences, we cannot rule out bias from time-varying local factors associated with both changes in the number of retail establishments and immigrant inflows. Big-box retailers may be located in areas where land values are increasing more slowly than in other areas, a factor that may also be associated with larger immigrant inflows. We cannot directly test this hypothesis, but we did find that between 1990 and 2000 the foreign-born population share did *not* grow faster in areas with a larger concentration of big-box retailers in 1992,[32] providing some evidence against this particular non-causal interpretation of our estimates.

If we assume that diversified products are more likely to be provided by a large number of stand-alone retail stores, and less likely to be provided by chain stores and especially big-box retailers, then the findings reported in this section suggest that, rather than increasing diversity, immigrants may have the opposite effect. This could be due to lower income levels, greater thrift, or greater price sensitivity that favors Wal-Marts over smaller outlets. However, since we lack information on the types of goods that consumers can buy at different stores, this conclusion is somewhat speculative. In the next section, we turn to the analysis of the restaurant sector, for which we can more readily associate the type and variety of establishments with the nature of the consumption choices they offer.

[32] We study the association (across tracts and aggregate of tracts) between the 1990-2000 changes in the share of the foreign-born population and the share of big-box retailers (in the total number of stores) in 1992. The association is negative across tracts, and positive, but not statistically significant, across aggregates of tracts based on the weights we use in the regression analysis.

4.4.2 Ethnic restaurants

The industrial classification of establishments in the NETS is extraordinarily rich: the dataset includes an 8-digit SIC code that in the case of eating places separately identifies restaurants of 13 different ethnicities. The full list of ethnic categories as well as other types of eating places is provided in Appendix Table A2. On the other hand, a shortcoming of the NETS data is that around 40% of establishments in the restaurant sector are generally classified as "eating place," without identification of a specific category. The availability of the company name, however, allows us to substantially refine the classification. For example, we can easily identify establishments that belong to well-known chains such as MacDonald's or Taco Bell (examples of fast-food places), Cold Stone or Baskin Robbins (examples of ice cream places), and Denny's or Sizzler (examples of family restaurants). More important, we can also use the company name to identify ethnic restaurants that may have been misreported as generic eating places. We do so by searching for words included in the business name that point to a specific ethnicity (e.g., "Chinese" or "Mandarin," "Japanese" or "Tokyo," "Italy" or "Milan"), or for words from the foreign language of reference (e.g. "wok," "samurai," or "trattoria"). The appendix table shows that our re-classification reduced by half the share of unclassified places, and also increased the share of restaurants of foreign ethnicities.[33]

Paralleling the analysis of the previous section, we are interested in exploring whether the presence of a large (and diverse) foreign-born population increases the choices of restaurants available to natives. First, we study the cross-sectional correlation between changes in the share of foreign ethnic restaurants and changes in the foreign-born share of the population, as in:

$$(7) \qquad \Delta logEthnic\_share_{a(c)} = \eta_i + \delta \Delta log\ (I/Pop)_{a(c)} + \phi \Delta log\ Pop_{a(c)} + \zeta_{a(c)}.$$

[33] We also separately identify three more categories of foreign ethnic restaurants: other Asian, other Hispanic, and other foreign ethnic restaurants.

Table 7 presents estimates of equation (7) for three different levels of aggregation: in Panel A we add up the number of restaurants and all population figures in tracts using the shopping weights defined in (2); in Panel B, we use shopping weights to define the growth of restaurants and of the total population, while we define the growth in the immigrant share of the population (*I/Pop*) on areas centered on *c* but defined using commuting-to-work weights; finally, in Panel C we aggregate all variables across the 25 MSA's in California. Regardless of the level of aggregation, we find that an increase in the foreign-born share of the population is associated with sizable increases in the share of ethnic restaurants.

The effects are larger when defining the immigrant share in an area that more closely represents the size of the labor market, suggesting that labor supply shifts may play an important role in the growth of ethnic restaurants (Panels B and C). For example, in column 1, when we define the dependent variable as the ratio of foreign ethnic restaurants to all eating places (except caterers), we find that a 1% increase in the foreign born share in the shopping area centered on *c* is associated with a 0.18% increase in the share of ethnic restaurants in the same area, while a 1% increase in the foreign born share in the commuting-to-work area centered on *c* is associated with a 0.44% increase in the share of ethnic restaurants in the reach of consumers residing in tract *c*. The results are robust to an alternative definition of the share of ethnic restaurants, that is, the ratio of foreign ethnic restaurants to all eating places excluding not only caterers but also fast-food and ice-cream places (column 2).

If these positive associations are really an effect of immigration, then the ethnicity of the restaurants that "result" from immigration ought to be associated with the ethnicity of the immigrants. To test this prediction, we estimate the relationship between the growth in the share of Hispanic restaurants and the growth in both the share of Hispanic and non-Hispanic foreign-

born in the population.[34] We focus on Hispanic immigration because it was by far the largest immigrant inflow in our sample period. As shown in columns 3 and 4, we find that the within-ethnicity correlations are positive and significant, regardless of the level of aggregation, while the cross-ethnicity associations are generally not significant, either economically or statistically (and are opposite-signed).

Finally, we ask whether increasing variety of ethnic groups is associated with increasing variety of ethnic restaurants. While studying the correlates of the share of foreign-born in the population has the advantage of analyzing the effects of immigration using a similar approach as in previous studies, it is not informative about "diversity" per se. Likewise, the share of ethnic non-American restaurants is not an appropriate measure of variety of choices available to those who decide to eat out. To measure diversity, we construct Herfindahl-Hirschman indexes (*HHI*) of concentration for the ten ethnic nativity groups (indexed by *j*) that are separately identified at the Census tract level (U.S. born individuals, and individuals born in Europe, Mexico, the Caribbean, Central America, South America, Canada, Asia, Africa, and Oceania), and for the eighteen types of ethnic restaurants (indexed by *m*) coded in the NETS or by us (listed in Appendix Table A2):

$$(8)\quad HHI^{pop}_{a(c)} = \sum_{j=1}^{10}\left(\frac{Pop_{j,a(c)}}{\sum_{j=1}^{10} Pop_{j,a(c)}}\right)^2 \text{ and } HHI^{eat}_{a(c)} = \sum_{m=1}^{18}\left(\frac{\#\,restaurants_{m,a(c)}}{\sum_{i=1}^{10}\#\,restaurants_{m,a(c)}}\right)^2.$$

Notice that increases in *HHI* indicate decreases in variety. Table 8 reports the relationship between changes in the two indexes defined above, and shows evidence of a positive association between the two, regardless of the level of aggregation, but to a much larger extent when the diversity of the population (HHI^{pop}) is evaluated for areas that capture the extent of the relevant

[34] Referring to Table A2, Hispanic restaurants are those of Mexican, Spanish, or other Hispanic ethnicity.

labor market (columns 2 and 3, using commuting-to-work weights and aggregation across MSA's, respectively), rather than when the index is defined to capture the diversity of the more limited pool of consumers (column 1). This suggests that the more varied the composition of the population across nativity groups becomes, the more varied is the composition of restaurants across ethnic lines, and that the potential channel through which immigration delivers "consumption variety" welfare gains is more likely to stem from a comparative advantage of immigrants in the production of ethnic food than from immigrants' consumption demands for ethnic food in restaurants.

Notice that in our equations we control for changes in the population. So, even if size per se creates diversity (Krugman, 1978), we are explicitly testing for the increased variety that may arise from *diversity* in the population, which can clearly be enhanced by immigration: in fact, the coefficient on the Herfindahl-Hirschman index can be interpreted as measuring the relationship between diversity in the population and diversity in the types of restaurants once changes in the size of the population are held constant.

5. Conclusions

The debate on the economic consequences of immigration focuses on whether immigrants take jobs away from natives and reduce wages for U.S. workers. In this paper, we direct attention to other possible economic effects of immigration. These effects stem from two factors: first, that immigrants bring not only their labor supply with them, but also their consumption demands; and second, that immigrants may have a comparative advantage in the production of ethnic goods.

We focus first on the effects of immigration on the scale of consumption demand and its induced effect on labor demand. To isolate scale effects, we estimate the relationship between

employment changes in industries that should be affected by the inflow of immigrants into a local economy via the consumption demands of these immigrants rather than their labor supply – in particular, non-traded industries that are not intensive users of immigrant labor. We find that population inflows into a local economy boost employment in these industries. When we estimate the separate effects of immigrant inflows, the evidence of scale effects is weaker, although it is quite strong in the retail sector – which is where we would expect to find such effects.

The more extensive empirical analysis we conduct focuses on the effects of immigration on the composition of output, stemming from the fact that immigrants are consumers with potentially different demand characteristics and also may have a comparative advantage in the production of ethnic goods. We look at these composition effects in a number of ways. First, we estimate the relationship between immigrant inflows and the size distribution of business establishments. This analysis indicates that immigration is associated with fewer stand-alone retail stores, and a greater number of chains and in particular big-box retailers. This evidence would appear to contradict a diversity-enhancing effect of immigration, although we cannot draw firm conclusions because we do not have information on the types of goods that consumers buy at different stores.

Consequently, we focus more of our attention on the relationship between immigration and the ethnic diversity of restaurants, for which we can much more readily identify the types of products consumed by customers. On this issue, the evidence indicates quite clearly that immigration is associated with increased ethnic diversity of restaurants, and that labor supply shifts play an important role in the growth of ethnic restaurants.

Our findings support the existence of some economic benefits of immigration that have

been rarely documented in the literature. Although a statement about welfare would require a more structural approach, the diversity effects of immigration in the restaurant sector expand natives' consumption choices and, as such, are potentially welfare-enhancing. We find that these effects likely stem from comparative advantages of immigrants in the production of ethnic food from their country of origin. We also find some evidence consistent with benefits to natives from the consumption effects of inflows of immigrant labor, which shift product demand in the retail sector outward, thus mitigating the negative effects of labor supply shifts on natives' wages. On the other hand, with respect to the composition of the retail sector, one might plausibly view our evidence as suggesting that immigrant inflows increase the homogeneity rather than the diversity of consumption choices.

References

Alesina, Alberto and Eliana La Ferrara. 2005. "Ethnic Diversity and Economic Performance." *Journal of Economic Literature*, 43, pp. 762-800.

Amuedo-Dorantes, Catalina and Sara de la Rica. 2008. "Complements or Substitutes? Immigrant and Native Task Specialization in Spain." CREAM Discussion Paper No. 16/08.

Altonji, Joseph, and David Card. 1991. "The Effects of Immigration on the Labor Market Outcomes of Less-Skilled Natives." In John Abowd and Richard B. Freeman, eds., *Immigration, Trade and the Labor Market*. Chicago: University of Chicago Press, pp. 201-34.

Bodvarsson, Orn, and Hendrik Van den Berg. 2006. "Does Immigration Affect Labor Demand? Model and Test." In *Research in Labour Economics*, 24, pp. 135-166.

Bodvarsson, Orn, Hendrik Van den Berg, and Joshua Lewer. 2008. "Measuring Immigration's Effects on Labor Demand: A Reexamination of the Mariel Boatlift." *Labour Economics*, 15, pp. 560-574.

Borjas, George. 1994. "The Economics of Immigration." *Journal of Economic Literature*, 32, pp. 1667-1717.

Borjas, George, Richard Freeman, and Lawrence Katz. 1996. "How Much do Immigration and Trade affect Labor Market Outcomes?" *Brookings Papers on Economic Activity*, 1, pp. 1-90.

Borjas, George. 2003. "The Labor Demand Curve Is Downward Sloping: Reexamining the Impact of Immigration on the Labor Market." *Quarterly Journal of Economics*, 118, pp. 335-1374.

Borjas, George, Jeffrey Grogger and Gordon Hanson. 2008. "Imperfect Substitution between Immigrants and Natives: A Reappraisal." NBER Working Paper No. 13887.

Borjas, George. 2009. "The Analytics of the Wage Effect of Immigration." NBER Working Paper No. 14796.

Broda, Christian, and David Weinstein. 2006. "Globalization and the Gains from Variety." *Quarterly Journal of Economics*, 121, pp. 541-585.

Card, David. 1990. "The Impact of the Mariel Boatlift on the Miami Labor Market." *Industrial and Labor Relations Review*, 43, pp. 245-257.

Card, David, and John DiNardo. 2000. "Do Immigrant Inflows Lead to Native Outflows?" *American Economic Review Papers and Proceedings*, 90, pp. 360-367.

Card, David. 2001. "Immigrant Inflows, Native Outflows, and the Local Labor Market Impacts of Higher Immigration." *Journal of Labor Economics*, 19, pp. 22-64.

Cortes, Patricia. 2008. "The Effect of Low-Skilled Immigration on US Prices: Evidence from CPI data." *Journal of Political Economy*, 116, pp. 381-422.

Feenstra, Robert. 1994. "New Product Varieties and the Measurement of International Prices." *American Economic Review*, 84, pp. 57-177.

Josiam, Bharath M., and Prema A. Monteiro. 2004. "Tandoori Tastes: Perceptions of Indian Restaurants in America." *International Journal of Contemporary Hospitality Management*, 16, pp. 18-26.

Kletzer, Lori, and J. Bradford Jensen. Forthcoming in "Measuring Tradable Services and the Task Content of Offshorable Services Jobs." In Katharine Abraham, Mike Harper, and James Spletzer, eds., *Labor in the New Economy*. Chicago: University of Chicago Press.

Kolko, Jed, and David Neumark. 2007. *Business Location Decisions and Employment Dynamics in California*. San Francisco: Public Policy Institute of California.

Kolko, Jed, and David Neumark. 2008. "Changes in the Location of Employment and Ownership: Evidence from California." *Journal of Regional Science*, 48, pp. 717-744.
Krugman, Paul. 1979. "Increasing Returns, Monopolistic Competition, and International Trade." *Journal of International Economics*, 9, pp. 469-479.
Lach, Saul. 2007. "Immigration and Prices." *Journal of Political Economy*, 115, pp. 548-587.
Lazear, Edward. 2000. "Diversity and Immigration." In George Borjas, ed., *Issues in the Economics of Immigration*. Chicago: University of Chicago Press, pp. 117-42.
Lewis, Ethan. 2005. "Immigration, Skill Mix, and the Choice of Technique." Federal Reserve Bank of Philadelphia Working Paper #05-08.
Liu, Yinghua, and SooCheong Jang. "Perceptions of Chinese Restaurants the U.S.: What Affects Customer Satisfaction and Behavioral Intentions?" Forthcoming in *International Journal of Hospitality Management*.
Neumark, David, and Jed Kolko. 2008. "Do Enterprise Zones Create Jobs? Evidence from California's Enterprise Zone Program." NBER Working Paper No. 14530.
Neumark, David, Junfu Zhang, and Brandon Wall. 2007. "Employment Dynamics and Business Relocation: New Evidence from the National Establishment Time Series." *Research in Labor Economics*, 26, pp. 39-83.
Ottaviano, Gianmarco and Giovanni Peri. 2006. "The Economic Value of Cultural Diversity: Evidence from US Cities." *Journal of Economic Geography*, 6, pp. 9-44.
Ottaviano, Gianmarco, and Giovanni Peri. 2006. "Rethinking the Effects of Immigration on Wages." NBER Working Paper No. 12497.
Ottaviano, Gianmarco, and Giovanni Peri. 2007. "The Effects of Immigration on U.S. Wages and Rents: A General Equilibrium Approach." Unpublished manuscript (October 2007).
Ottaviano, Gianmarco, and Giovanni Peri. 2008. "Immigration and National Wages: Clarifying the Theory and the Empirics." NBER Working Paper No. 14188.
Patel, Krishna and Vella, Francis. 2007. "Immigrant Networks and their Implications for Occupational Choice and Wages." IZA Working Paper No. 3217.
Peri, Giovanni and Sparber Chad. "Task Specialization, Immigration, and Wages." Forthcoming in *American Economic Journal: Applied Economics*.
Ruggles, S., M. Sobek, T. Alexander, C. A. Fitch, R. Goeken, P. K. Hall, M. King, and C. Ronnander. 2004. "Integrated Public Use Microdata Series: Version 3.0." Minneapolis, MN: Minnesota Population Center.
Saiz, Albert. 2007. "Immigration and Housing Rents." *Journal of Urban Economics*, 61, pp. 345-371.
Sparber, Chad. 2008. "A Theory of Racial Diversity, Segregation, and Productivity." *Journal of Development Economics*, 87, pp. 210-226.
Waldfogel, Joel. 2008. "The Median Voter and the Median Consumer: Local *Private* Goods and Population Composition." *Journal of Urban Economics*, 63, pp. 567-82.

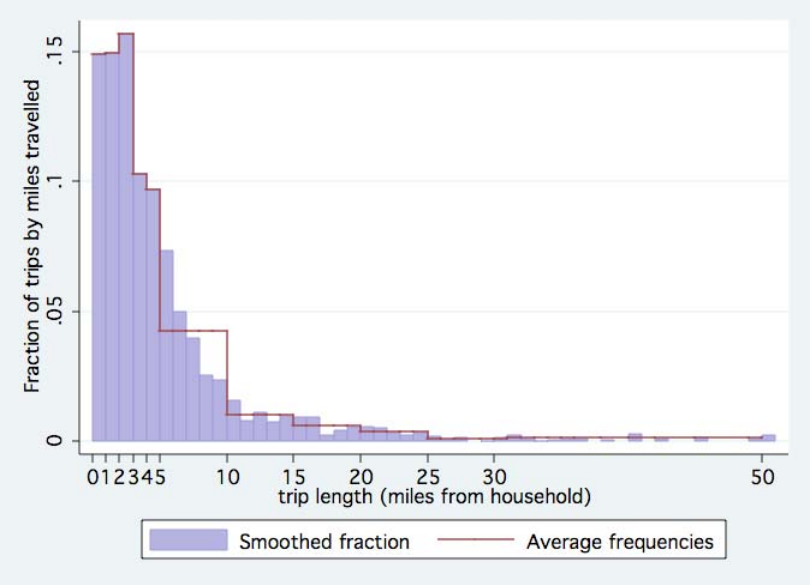
Figure 1: Identification of demand shocks based on industry differences

Effects of immigrant inflows

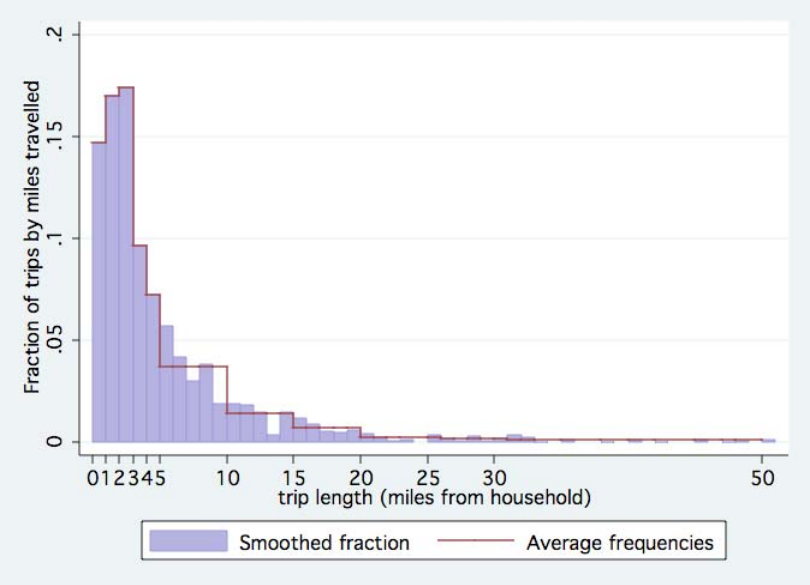
	Immigrant non-intensive	Immigrant intensive
Traded	**No** output demand shift, **no** labor supply shift	**No** output demand shift, **positive** labor supply shift, potential immigration response to prior demand shock
Non-traded	**Positive** output demand shift, **no** labor supply shift	**Positive** output demand shift, **positive** labor supply shift, potential immigration response to prior demand shock

Figure 2: Distribution of shopping trips by miles in California, 2001

A. Los Angeles, Long Beach, Orange County and Riverside



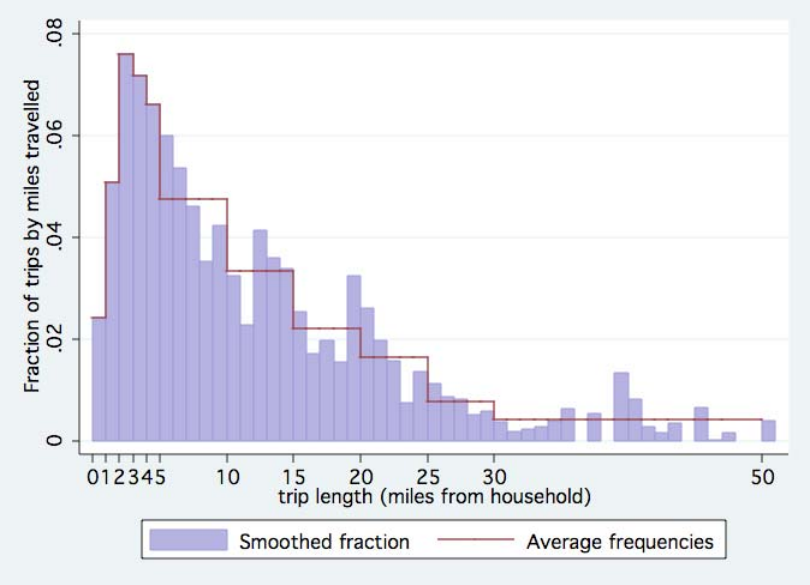
B. Rest of California



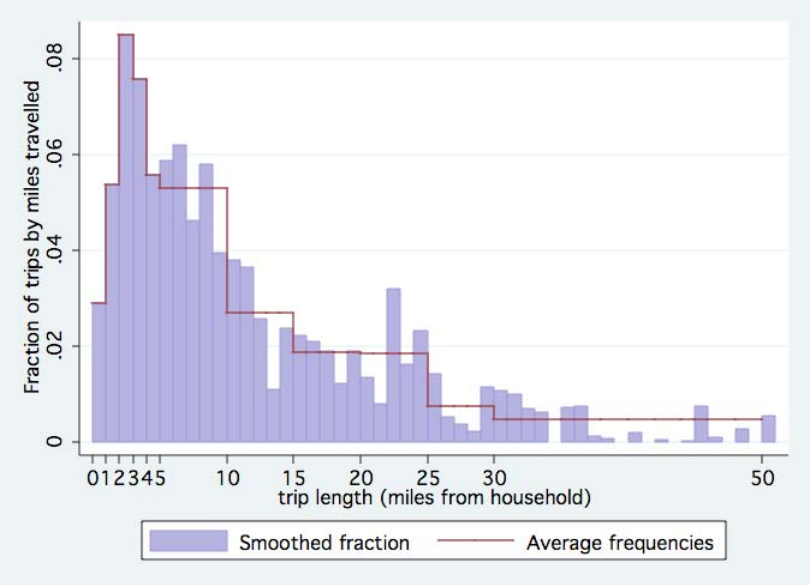
Notes: The figures plot smoothed distributions of shopping trips by distance traveled (miles). The distance is between the person's residence and the shopping destination. The piecewise lines plot the average frequencies in 1-, 5- or 20-mile distance bins.
Sample: Panel A—1,328 trips made for shopping purposes (general retail, food purchase, and personal services) by residents in Los Angeles, Long Beach, Orange County and Riverside; Panel B—1,628 shopping trips made by residents of urbanized areas in the rest of California.
Source: 2001 National Household Travel Survey.

Figure 3: Distribution of commuting-to-work trips by miles in California, 2001

A. Los Angeles, Long Beach, Orange County and Riverside



B. Rest of California



Notes: The figures plot smoothed distributions of trips to work by distance traveled (miles). The distance is between the person's residence and the place of work. The piecewise lines plot the average frequencies in 1-, 5- or 20-mile distance bins.
Sample: Panel A—598 trips made to go to work by residents in Los Angeles, Long Beach, Orange County and Riverside; Panel B—695 trips made to go to work by residents of urbanized areas in the rest of California.
Source: 2001 National Household Travel Survey.

Table 1. Immigrant shares in the California labor force, by industry (2000)

		Immigrant share (%)	% of labor force	
			Total	Foreign-born
Overall average		*30.53*		
Industry				
Above average				
Agriculture, forestry, fishing, & hunting	TR	*65.16*	*1.97*	*4.04*
Manufacturing: food & textile	TR	*61.75*	*2.27*	*4.63*
Accommodation and food services	NT	*43.53*	*6.06*	*8.61*
Manufacturing: metal, electrical, & electronic	TR	*43.08*	*8.49*	*12.07*
Admin., support, waste mgmt. services	NT	*40.05*	*4.12*	*5.44*
Repair, personal, household services	NT	*39.54*	*5.04*	*6.56*
Manufacturing: paper & chemical	TR	*38.03*	*2.42*	*3.03*
Wholesale trade	TR	*36.75*	*4.02*	*4.88*
Construction	NT	*31.41*	*6.24*	*6.37*
Below average				
Mail & warehousing	-	*28.98*	*1.28*	*1.23*
Transportation	-	*28.43*	*2.68*	*2.5*
Retail trade: miscellaneous	NT	*28.27*	*7.12*	*6.63*
Health care and social assistance	NT	*28.10*	*9.88*	*9.11*
Retail trade: hobby & general	NT	*24.86*	*3.89*	*3.17*
Real estate, rental, & leasing	-	*23.24*	*2.13*	*1.63*
Finance and insurance	-	*22.93*	*4.63*	*3.48*
Professional, scientific, & technical serv.	-	*22.59*	*7.25*	*5.39*
Management of companies/enterprises	-	*19.12*	*0.04*	*0.02*
Information	-	*19.11*	*3.90*	*2.48*
Arts, entertainment, & recreation	-	*18.73*	*2.06*	*1.25*
Educational services	NT	*17.24*	*8.41*	*4.74*
Utilities	TR	*14.70*	*0.77*	*0.38*
Public administration	-	*13.41*	*5.16*	*2.28*
Mining	TR	*12.23*	*0.16*	*0.06*

Legend: TR: traded industries; NT: non-traded industries.
Notes: NAICS 2-digit industries ranked by the share of foreign-born in the labor force, from the most immigrant-intensive sector to the least.
Sources: IPUMS 2000 (Ruggles et al., 2004).

Table 2. Employment growth across Census tracts and population growth in surrounding areas

Sectors	All	NT	NT non-immigrant intensive			
			All	Retail	Education	Health
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A						
Δ log population	1.241***	1.332***	1.063***	1.248***	0.928**	1.145***
	(0.139)	(0.178)	(0.142)	(0.148)	(0.340)	(0.250)
Panel B						
Δ immigrant/native ratio	0.723***	0.944**	0.368	0.880***	0.151	-0.207
	(0.223)	(0.366)	(0.294)	(0.288)	(0.658)	(0.371)
Δ log native population	1.239***	1.308***	1.141***	1.267***	1.016***	1.319***
	(0.144)	(0.131)	(0.150)	(0.166)	(0.310)	(0.236)
F-test [H_0: θ=1]	5.737	1.775	10.263	1.127	3.547	26.432
Prob.>F	0.025	0.195	0.004	0.299	0.072	0.000

Notes: Dependent variable: 1992-2002 change in the log number of employees in establishments located in a Census tract and belonging to the industry or industries indicated. Population figures are defined as the weighted sum of the population in surrounding tracts, where the weights map the distribution of shopping trips from the National Household Travel Survey, 2001. Observations: 6,793 populated Census tracts located within one of the 25 MSA's in California. Estimates are weighted by the tract-industry employment level in 1992. Standard errors (in parentheses) are clustered at the MSA level. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.
Sources: NETS, CA 1993 and 2003; Neighborhood Change Database, 1990 and 2000 Censuses.

Table 3. Growth in the number of establishments across Census tracts and population growth in surrounding areas

Sectors	All	NT	NT non-immigrant intensive			
			All	Retail	Education	Health
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A						
Δ log population	0.683***	0.606***	0.729***	0.752***	0.525***	0.988***
	(0.109)	(0.151)	(0.185)	(0.243)	(0.106)	(0.107)
Panel B						
Δ immigrant/native ratio	0.338***	0.308*	0.263	0.399	0.304	0.282
	(0.096)	(0.178)	(0.243)	(0.344)	(0.222)	(0.200)
Δ log native population	0.706***	0.639***	0.783***	0.810***	0.524***	1.038***
	(0.101)	(0.139)	(0.160)	(0.215)	(0.102)	(0.105)
F-test [H_0: θ=1]	10.187	7.118	8.680	3.061	1.143	12.439
Prob.>F	0.004	0.013	0.007	0.093	0.296	0.002

Notes: Dependent variable: 1992-2002 change in the log number of establishments located in a Census tract and belonging to the industry or industries indicated. Population figures are defined as the weighted sum of the population in surrounding tracts, where the weights map the distribution of shopping trips from the National Household Travel Survey, 2001. Observations: 6,793 populated Census tracts located within one of the 25 MSA's in California. Estimates are weighted by the tract-industry number of establishments in 1992. Standard errors (in parentheses) are clustered at the MSA level. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.
Sources: NETS, CA 1993 and 2003; Neighborhood Change Database, 1990 and 2000 Censuses.

Table 4. Growth of establishments of different sizes and growth in the foreign-born share across Census tracts

Retail stores	All			Food, Clothing, General Merchandise, Miscellaneous		
Number of employees	1-9	10-99	100+	1-9	10-99	100+
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Dependent variable: Δ log share of stores						
Δ log foreign share	-0.041**	0.255*	0.390	-0.048**	0.357**	0.280
	(0.017)	(0.136)	(0.258)	(0.018)	(0.156)	(0.280)
Δ log population	-0.030*	0.273**	0.280	-0.019	0.244	0.409*
	(0.015)	(0.127)	(0.214)	(0.014)	(0.152)	(0.213)
Panel B: Dependent variable: Δ log number of stores						
Δ log foreign share	-0.374**	-0.078*	0.056	-0.386*	0.019	-0.059
	(0.141)	(0.041)	(0.194)	(0.209)	(0.108)	(0.193)
Δ log population	0.703***	1.006***	1.013***	0.804***	1.067***	1.232***
	(0.151)	(0.121)	(0.176)	(0.140)	(0.138)	(0.214)

Notes: Dependent variable: Change in the log of the share (Panel A) or the log of the number (Panel B) of retail establishments with 1 to 9 employees, 10 to 99 employees or 100 or more employees. Sample in columns 4 through 6 is restricted to establishments with NAICS 3-digit codes 445 (grocery stores), 448 (clothing stores) except luggage and leather goods stores, 452 (department and other general merchandise stores), and 453 (miscellaneous stores) except pet supplies stores and manufactured home dealers. Both dependent variables and population figures are defined for aggregates of tracts, using weights that map the distribution of shopping trips from the National Household Travel Survey, 2001. Observations: 6,807 tracts within MSA's. Estimates are weighted by the weighted number of retail establishments across aggregates of tracts in 1992. Standard errors (in parentheses) are clustered at the MSA level. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.
Sources: NETS, CA 1993 and 2003; Neighborhood Change Database, 1990 and 2000 Censuses.

Table 5. Growth of stand-alone or small-chain establishments and growth in the foreign-born share across Census tracts

Retail sector	All			Food, Clothing, General Merchandise, Miscellaneous		
Number of stores with same headquarter	One	1-10	2-10	One	1-10	2-10
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Dependent variable: Δ log share of stand-alone or small-chain stores						
Δ log foreign share	-0.092***	-0.066***	0.296**	-0.089***	-0.066***	0.335**
	(0.022)	(0.014)	(0.124)	(0.030)	(0.021)	(0.158)
Δ log population	-0.059**	-0.051***	0.204	-0.039	-0.042***	0.073
	(0.024)	(0.015)	(0.144)	(0.026)	(0.014)	(0.239)
Panel B: Dependent variable: Δ log number of stand-alone or small chain stores						
Δ log foreign share	-0.425***	-0.399***	-0.037	-0.427*	-0.403*	-0.003
	(0.144)	(0.137)	(0.122)	(0.222)	(0.212)	(0.128)
Δ log population	0.674***	0.682***	0.937***	0.784***	0.780***	0.895***
	(0.158)	(0.149)	(0.115)	(0.148)	(0.138)	(0.210)

Notes: Dependent variable: Change in the log of the number of establishments with unique headquarter DUNS number in California (columns 1 and 4), whose headquarter DUNS number is shared by no more than 9 other establishments in California, either including (columns 2 and 5) or excluding (columns 3 and 6) stand-alone stores. Both dependent variables and population figures are defined for aggregates of tracts, using weights that map the distribution of shopping trips from the National Household Travel Survey, 2001. Observations: 6,807 tracts within MSA's. Estimates are weighted by the weighted number of retail establishments across aggregates of tracts in 1992. Standard errors (in parentheses) are clustered at the MSA level. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.
Sources: NETS, CA 1993 and 2003; Neighborhood Change Database, 1990 and 2000 Censuses.

Table 6. Changes in the number of big-box retailers and changes in the foreign-born share across bundles of Census tracts

Big-box retailers	Short list		Long list	
Reported sector of activity	Wholesale and retail trade	Retail trade only	Wholesale and retail trade	Retail trade only
	(1)	(2)	(3)	(4)
Panel A: Dependent variable: Δ number of big-box retailer establishments				
Δ foreign share	0.129**	0.168**	0.222	0.247*
	(0.062)	(0.069)	(0.150)	(0.135)
Δ log population	0.093***	0.085***	0.131***	0.126***
	(0.017)	(0.018)	(0.028)	(0.027)
Panel B: Dependent variable: Δ share of big-box retail/total retail establishments				
Δ foreign share		0.008		0.019*
		(0.006)		(0.009)
Δ log population		0.008***		0.010***
		(0.002)		(0.002)

Notes: Dependent variable: Change in the number of big-box retailers: Wal-Mart, Kmart, Costco, Target, and Lowe's (columns 1 and 2); these as well as Best Buy, Home Depot, Staples, Office Depot, Circuit City, Sears, and Fry's (columns 3 and 4). Both dependent variables and population figures are defined for aggregates of tracts, using weights that map the distribution of shopping trips from the National Household Travel Survey, 2001. Observations: 6,807 tracts within MSA's. Standard errors (in parentheses) are clustered at the MSA level. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.
Sources: NETS, CA 1993 and 2003; Neighborhood Change Database, 1990 and 2000 Censuses.

Table 7. Changes in the log share of foreign ethnic restaurants and changes in the share of foreign-born population across bundles of Census tracts

Dependent variable:	Foreign ethnic restaurants over all eating places		Hispanic ethnic restaurants over all eating places	
	Excluding caterers	Excluding caterers, fast food, ice-cream places	Excluding caterers	Excluding caterers, fast food, ice-cream places
	(1)	(2)	(3)	(4)
Panel A: Aggregation of all variables using weights from distribution of shopping trips				
Δ log foreign share	0.180**	0.229***		
	(0.066)	(0.069)		
Δ log foreign Hispanic share			0.364***	0.359***
			(0.048)	(0.055)
Δ log foreign non-Hispanic share			-0.130	-0.114
			(0.092)	(0.089)
Δ log population	-0.058	0.111	0.201	0.400**
	(0.097)	(0.101)	(0.176)	(0.187)
Panel B: As (A) except foreign share defined using working weights				
Δ log foreign share	0.440***	0.407***		
	(0.108)	(0.116)		
Δ log foreign Hispanic share			0.458***	0.384***
			(0.079)	(0.088)
Δ log foreign non-Hispanic share			-0.105	-0.093
			(0.159)	(0.157)
Δ log population	-0.087	0.116	0.217	0.447**
	(0.088)	(0.094)	(0.200)	(0.213)
Panel C: Aggregation of variables across MSA's				
Δ log foreign share	0.632***	0.584***		
	(0.089)	(0.086)		
Δ log foreign Hispanic share			0.361***	0.274**
			(0.093)	(0.102)
Δ log foreign non-Hispanic share			-0.050	-0.012
			(0.145)	(0.146)
Δ log population	-0.857***	-0.645***	-0.378	-0.068
	(0.233)	(0.203)	(0.344)	(0.374)

Notes: Dependent variable: Share of foreign ethnic restaurants over: the total number of eating places except caterers (columns 1 and 3) or the total number of eating places except caterers, fast-food places and ice-cream places (columns 2 and 4). All variables are aggregated across Census tracts using weights that map the distribution of shopping trips from the 2001 National Household Travel Survey (Panels A and B, except foreign share in Panel B defined using commuting-to-work weights) or across MSA's (Panel C). Observations: 6,807 tracts within MSA's (Panels A and B) and 25 MSA's (Panel C). Estimates are weighted by the 1992 number of restaurants, based on the same aggregation of tracts. Standard errors (in parentheses) in Panels A and B are clustered at the MSA level. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Sources: NETS, CA 1993 and 2003; Neighborhood Change Database and Summary Files (SF4), 1990 and 2000 Censuses.

Table 8. Changes in the Herfindahl-Hirschman index of concentration for ethnic restaurants and changes in the index of concentration for nativity groups

Aggregation	Census tract, weighted sum of restaurants and populations		Across MSA's
HH nativity index defined using	Shopping weights	Working weights	
	(1)	(2)	(3)
Δ HH index for nativity groups	0.042	0.161**	0.316***
	(0.075)	(0.060)	(0.080)
Δ log population	0.031	0.035*	0.193***
	(0.021)	(0.019)	(0.045)

Notes: Dependent variable: Changes in the Herfindahl-Hirschman index of concentration for ethnic restaurants, defined over 18 categories of ethnic restaurants (American, Cajun, Chinese, French, German, Greek, Indian/Pakistan, Italian, Japanese, Korean, Lebanese, Mexican, Spanish, Thai, Vietnamese, other Asian, other Hispanic, and other foreign). The independent variable capturing diversity is the change in the Herfindahl-Hirschman index of concentration for nativity groups, defined over 10 categories (US-born; born in: Europe, Mexico, Caribbean countries, Central America, South America, Canada, Asia, Africa, and Oceania). All variables are aggregated across Census tracts using weights that map the distribution of shopping trips from the 2001 National Household Travel Survey (columns 1 and 2, except HH index fro nativity groups in column 2 defined using commuting-to-work weights) or across MSA's (column 3). Observations: 6,807 Census tracts within MSA's (columns 1 and 2) and 25 MSA's (column 2). Estimates are weighted by the 1992 number of restaurants, based on the same aggregation of tracts. Standard errors (in parentheses) adjusted for heteroscedasticity and (in column 1) clustering across MSA's. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Sources: NETS, CA 1993 and 2003; Neighborhood Change Database and Summary Files (SF4), 1990 and 2000 Censuses.

Appendix Table A1. Summary statistics, across Census tracts

Census of Population data	1990	1990-2000 growth
Total population	4,321 (1,853)	0.12 (0.7)
Foreign population	936 (824)	0.36 (0.50)
Native population	3,295 (1,610)	0.06 (0.37)
Foreign-born share	0.21 (0.15)	0.23 (0.36)
Hispanic foreign-born share	0.11 (0.14)	0.40 (0.72)
NETS data	1992	1992-2002 growth
Employment	2,105.6 (4,748.8)	0.20 (0.49)
Number of establishments	188.2 (245.3)	0.35 (0.30)
Retail stores		
Employment	226.9 (390.7)	0.05 (0.77)
Total number of establishments	31.6 (34.6)	0.11 (0.49)
Food, clothing, general merchandise, miscellaneous	14.6 (20.7)	0.20 (0.58)
1-9 employees	28.2 (29.9)	0.10 (0.50)
10-99 employees	3.48 (5.13)	0.11 (0.53)
100 or more employees	1.12 (0.57)	0.03 (0.23)
Stand-alone (unique DUNS #)	27.8 (28.7)	0.07 (0.49)
Small chains (at most 9 stores with = headquarter)	2.4 (4.0)	0.08 (0.52)
Big-box retailers (short list)	0.07 (0.28)	0.04 (0.34)[(a)]
Including wholesale trade sector	0.08 (0.31)	0.04 (0.34)[(a)]
Big-box retailers (long list)	0.09 (0.36)	0.11 (0.53)[(a)]
Including wholesale trade sector	0.11 (0.40)	0.11 (0.53)[(a)]
Restaurants		
Number of establishments		
Total	6.02 (8.33)	0.14 (0.54)
Excluding caterers	5.81 (8.13)	0.14 (0.54)
Excluding caterers, fast-food, ice-cream places	4.20 (6.11)	0.07 (0.55)
Foreign ethnic restaurants	1.52 (2.53)	0.10 (0.55)
Hispanic ethnic restaurants	0.50 (0.97)	0.08 (0.50)

Notes: The table reports mean values (and standard deviations in parentheses). Figures are calculated for the 6,807 Census tracts located in one of the 25 MSA's in California. Growth rates are calculated as changes in the log of the variable. (a) This is the absolute change, not the growth rate.

Sources: NETS, CA 1993 and 2003; Neighborhood Change Database and Summary files (SF4), 1990 and 2000 Censuses.

Appendix Table A2. Distribution of eating places in California by 8-digit SIC categories, 1992 and 2002

Sic 8-digit industry	Reported %		Recoded %	
	1992	2002	1992	2002
Eating places	42.26	39.37	24.3	20.16
Ethnic food restaurants	0.83	1.06	0.37	0.49
American	2.61	1.91	2.25	1.65
Cajun	0.06	0.07	0.03	0.04
Chinese	4.50	4.17	6.39	5.80
French	0.61	0.44	1.48	1.34
German	0.15	0.11	0.28	0.21
Greek	0.16	0.15	0.30	0.26
Indian/Pakistan	0.24	0.38	0.48	0.65
Italian	2.79	2.53	4.21	3.52
Japanese	1.43	1.75	1.97	2.40
Korean	0.13	0.16	0.19	0.25
Lebanese	0.02	0.02	0.02	0.02
Mexican	4.42	5.1	8.24	8.45
Spanish	0.07	0.06	0.04	0.05
Thai	0.37	0.57	0.96	1.20
Vietnamese	0.13	0.21	0.32	0.45
Other Asian			0.30	0.35
Other Hispanic			0.04	0.06
Other non-American			0.08	0.07
Ice cream and soft drink stands	0.16	0.32	0.36	0.35
Concessionaire	0.31	0.24	0.28	0.21
Frozen yogurt stand	0.82	0.32	0.8	0.31
Ice cream stands	1.69	1.37	1.73	1.36
Snow cone stand	0.03	0.05	0.03	0.04
Soda fountain	0.06	0.06	0.05	0.05
Soft drink stand	0.04	0.04	0.03	0.03
Fast-food restaurants and stands	1.92	1.31	2.21	1.60
Box lunch stand	0.05	0.04	0.04	0.03
Carry-out only (except pizza)	0.94	0.83	0.66	0.54
Chili stand	0.02	0.02	0.01	0.01
Coffee shop	1.66	3.12	2.34	3.63
Delicatessen	1.43	1.08	1.34	0.98
Drive-in restaurant	0.65	0.44	0.58	0.39
Fast-food, chain	3.96	7.75	11.54	18.81
Fast-food, independent	1.55	1.33	1.20	0.98
Food bars	0.03	0.03	0.03	0.02
Grills	0.49	0.89	0.46	0.58
Hamburger stand	0.53	0.54	0.47	0.39
Hot dog stand	0.35	0.31	0.32	0.29
Sandwiches shop	2.30	2.24	1.81	1.58
Snack bar	0.26	0.22	0.23	0.18
Snack shop	0.13	0.10	0.11	0.09
Lunchrooms and cafeterias	0.03	0.35	1.97	2.18
Automat	0.01	0.01	0.01	0
Cafeteria	0.42	0.30	0.36	0.23
Luncheonette	0.07	0.05	0.07	0.05
Lunchroom	0.01	0	0.01	0
Restaurant, lunch counter	0.04	0.05	0.04	0.04

Sic 8-digit industry	Reported %		Recoded %	
	1992	2002	1992	2002
Family restaurants	0.56	0.77	0.44	0.55
Family: chain	0.97	1.09	1.19	1.13
Family: independent	1.69	1.12	1.42	0.94
Pizza restaurants	3.68	4.3	4.23	4.01
Pizzeria, chain	1.41	1	1.34	1.84
Pizzeria, independent	1.40	0.76	1.29	0.68
Seafood restaurants	1.13	0.89	1.16	0.96
Oyster bar	0.01	0	0.01	0
Seafood shack	0.04	0.11	0.03	0.08
Steak and barbecue restaurants	0.04	0.05	0.17	0.13
Barbecue restaurant	0.56	0.61	0.52	0.56
Steak restaurant	0.78	0.61	0.53	0.4
Other				
Buffet	0.12	0.24	0.10	0.12
café	2.27	2.29	2.07	2.02
Caterers	3.69	3.79	3.57	3.60
Chicken restaurant	0.42	0.43	0.21	0.23
Commissary restaurant	0.02	0.02	0.01	0.02
Contract food services	0.18	0.18	0.10	0.11
Diner	0.17	0.17	0.16	0.14
Dinner theater	0.03	0.04	0.03	0.04
Health food restaurant	0.09	0.08	0.09	0.07
Total	100	100	100	100
Number of establishments	41,000	47,608	41,000	47,608

Notes: The sample is restricted to business establishments with SIC 4-digit industry 5812. The table reports the distribution of SIC 8-digit industries. Percentages shown for bold-faced entries are for restaurants that are not more finely classified. The recoding of establishments is based on the company name, as described in the text. For example, we can easily identify well-known chains (of fast-food, ice-cream places and family restaurants). Also, ethnic restaurants of foreign ethnicity are identified based on the presence of foreign words in the company name.
Source: NETS 1993 and 2003.