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ABSTRACT

An ongoing debate sets capital budgeting against market timing. The primary difficulty in evaluating these theories is finding distinct exogenous proxies for investment opportunities and mispricing. We use demand shifts induced by demographics to address this problem, and hence, provide a more definitive analysis of the theories. According to capital budgeting, industries anticipating positive demand shifts in the near future should issue more equity (and debt) to finance additional capacity. To the extent that demographic shifts in the more distant future are not incorporated into equity prices, market timing implies that industries anticipating positive demand shifts in the distant future should issue less equity due to undervaluation. We find evidence supporting both capital budgeting and market timing: new listings and equity issuance by existing listings respond positively to demand shifts up to 5 years ahead, and negatively to demand shifts 5 to 10 years ahead.

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1 Introduction

The determinants of equity issuance are the subject of an ongoing debate in corporate finance. Are initial and seasoned offerings best explained by the demands for external finance, or are they driven by market timing in response to company misvaluation?

Capital budgeting holds that firms issue equity (and debt) to invest the proceeds in positive net-present-value projects, for example to expand production when demand is high (Modigliani and Miller, 1958). Market timing instead holds that firms issue equity to take advantage of mispricing by investors. (Baker, Ruback, and Wurgler, forthcoming; Stein, 1996).

One crucial difficulty in evaluating these theories is the lack of exogenous proxies for investment opportunities, on the one hand, and for misvaluation, on the other hand. For instance, the relationship between the market-to-book ratio and corporate decisions could reflect investment opportunities (Campello and Graham, 2006), mispricing related to accruals or dispersion of opinion (Gilchrist, Himmelberg, and Huberman, 2005; Polk and Sapienza, forthcoming), or both (Hertzel and Yi, 2007). These issues are also linked to whether market-to-book is a proxy for risk (Fama and French, 1992) or a measure of mispricing relative to accounting fundamentals (Lakonishok, Shleifer, and Vishny, 1994).

We use demographic variables as proxies for both in a novel evaluation of these two theories. We consider industries that are affected by predictable shifts in cohort sizes, such as breweries and long-term care facilities. These industries have distinctive age profiles of consumption. Therefore, forecastable changes in the age distribution produce forecastable shifts in demand for various goods. Even though these demand shifts only capture a small component of the variation in investment opportunities and mispricing, they are exogenous from the perspective of the manager. As such, they allow us to address the endogeneity problem and identify separately the managerial response to variation in investment opportunities and mispricing.

We distinguish between shifts that will affect an industry in the near future, up to 5 years ahead, and shifts that will occur in the more distant future, 5 to 10 years ahead. As the model in Section 2 demonstrates, traditional capital budgeting indicates that industries affected by positive demand shifts in the near future should raise capital to increase production. Positive demand shifts increase marginal productivity and the optimal level of investment; in turn, the desire for more investment induces demand for additional capital. Therefore, demand shifts due to demographics in the near future should be positively related to equity issuance.

Another prediction relies on the assumption that investors are short-sighted and hence partially neglect forecastable demographic shifts further in the future (5 to 10 years ahead). Indeed, demand shifts due to demographics 5-10 years ahead significantly predict industry-level abnormal returns (DellaVigna and Pollet, 2007). In our model, we assume that managers in a particular industry have longer foresight horizons than investors—perhaps because managers usually develop in-depth knowledge essential to long-term planning. Under this assumption, demand shifts in the distant future serve as proxies for mispricing and managers react to this mispricing by modifying their equity issuance decisions. Companies in industries with positive demand shifts 5 to 10 years ahead will tend to be undervalued and managers respond by reducing equity issuance (or repurchasing equity). Conversely, companies in industries with negative demand shifts 5 to 10 years ahead will tend to be overvalued, and managers react by issuing additional equity. This analysis assumes that the announcement of issuing or repurchasing equity does not cause investors to fully eliminate the mispricing.

We also consider a special case in which time-to-build considerations create a trade-off between raising equity to finance investment and repurchasing equity to exploit mispricing. In this setting firms facing high demand growth in the distant future have favorable long-term investment opportunities but cannot delay investment until the associated undervaluation eventually disappears. Hence, the model indicates that the predictions outlined in the two previous paragraphs should be attenuated in high time-to-build industries compared to low time-to-build industries.

Although the model in Section 2 does not include debt, we analyze a prediction regarding debt. Capital budgeting suggests that companies affected by positive demand shifts in the near-term should raise capital. These companies can raise capital by borrowing through loans or by issuing bonds (debt issuance) in addition to issuing equity. Market timing does not have a clear prediction about the relationship between long-term demand shifts and debt issuance.[1]

[1] In this context the extent to which debt is mispriced when equity is mispriced is unclear. In addition, it is possible that debt issuance is a substitute for equity issuance if equity is mispriced. For instance, a firm with undervalued equity might issue debt to repurchase equity or to finance greater investment.

To summarize, capital budgeting predicts that demand shifts due to demographics in the near future should be positively related to debt and equity issuance, while market timing suggests that demand shifts further in the future should be negatively related to equity issuance. We note that these two predictions are not mutually exclusive. We test these predictions using various measures of debt and equity. In Section 3 we describe the construction of demand shifts due to demographics by combining forecasts of future cohort sizes and estimates of age profiles of consumption and we introduce the measures of external corporate financing.

In Section 4 we analyze the impact of demographics on the likelihood of initial public offerings (IPOs) and additional equity issuance by listed firms in an industry. We find that demand shifts due to demographics up to 5 years ahead are positively related to the ratio of new listings to existing listings, consistent with capital budgeting. Demand shifts due to demographics 5 to 10 years are significantly negatively related with this IPO measure, consistent with market timing. We find similar results for the ratio of listing with large additional equity issuance to existing listings. This measure exhibits a (significant) positive response to predicted demand shifts up to 5 years ahead, but a significant negative response to predicted demand shifts 5 to 10 years ahead. As predicted, the results for equity issuance are stronger for industries that are less competitive and for industries that have a lower time-to-build.

We also consider the impact of demand shifts on debt issues and repurchases. The evidence regarding debt is imprecisely estimated. For most of the specifications, the sign of the coefficient estimates for demand shifts in the near future is consistent with capital budgeting but the estimates are not statistically significant. There is also little statistical evidence that demand shifts in the distant future are related to debt policy.[2]

Finally, we provide evidence on the channels underlying these results. The model in Section 2 links equity and debt decisions to demand shifts due to demographics through investment. We find that positive demand shifts up to 5 years ahead increase investment. We also find that these demand shifts increase Research and Development (R&D). These results provide evidence that investment, broadly defined, is a determinant of the demand for external capital.

[2]However, in a few specifications long-term demand shifts are negatively related to debt repurchases. This result could support market timing if debt is used as a substitute for equity, that is, undervalued firms repurchase equity but do not repurchase debt due to financing constraints.

In Section 5 we discuss five alternative explanations: signalling, agency problems, large fixed costs of equity issuance, globalization, and the presence of unobserved time patterns correlated with the demographic variables.

This paper is related to the literature on the empirical evidence of market timing.[3] Relative to this literature, we consider a novel exogenous proxy for mispricing. The paper is also related to the literature on corporate response to anticipated demand shifts. Acemoglu and Linn (2005) document that research and investment in classes of pharmaceuticals responds to anticipated shifts in demand. Ellison and Ellison (2000) document that pharmaceutical firms respond to anticipated patent expiration by altering their advertising decisions. Goolsbee and Syverson (2008) document that airline companies cut their fare in response to the anticipated entry of a competitor. Unlike these papers, we focus on equity and debt financing decisions. This paper also addresses the literature on the effect of demographics on corporate outcomes (Acemoglu and Linn, 2005; Mankiw and Weil, 1989) and on aggregate stock returns (Poterba, 2001). Finally, we also extend the discussion of the role of attention allocation in economics and finance.[4] The evidence in this paper suggests that the inattention of investors with respect to long-term information (DellaVigna and Pollet, 2007) affects corporate financing decisions.

2 A Model

We consider a simple two-period model of investment and equity issuance. The investment opportunity is a long-term project. This long-term project may be financed in either period 1 or period 2 and the cash flow from this project is realized at the end of period 2. In the second period the manager and the investors have the same (correct) expectations about the expected value of the investment opportunity. However, in the first period investors do not correctly foresee the expected value of the investment opportunity in period 2, since the level of demand is

[3] Baker, Ruback, and Wurgler, forthcoming; Campello and Graham, 2006; Chirinko and Schaller, 2007; Gilchrist, Himmelberg, and Huberman, 2005; Hertzel and Yi, 2007; Jenter, Lewellen, and Warner, 2007; Polk and Sapienza, forthcoming.

[4] Barber and Odean, forthcoming; Cohen and Frazzini, forthcoming; Daniel, Hirshleifer, and Subrahmanyam, 1998; DellaVigna and Pollet, 2009; Hirshleifer, Lim, and Teoh, 2004 and forthcoming; Hong and Stein, 1999; Huberman and Regev, 2001; Peng and Xiong, 2006

beyond their foresight horizon.[5] Only the manager foresees the expected value of the investment opportunity correctly since s/he has a longer foresight horizon. Therefore, limited attention induces time-varying asymmetric information between the investors and the manager. We also consider the rational expectations case where investors have correct expectations throughout.

To match the empirical evidence, it helps to think of the two periods as approximately 5 years apart. We assume that investors are naive about their limited foresight, and hence, do not use the equity issuance policy to make inferences about the information known by the manager. Also, since our goal is to focus on the impact of investor foresight, we do not consider other forms of asymmetric information. We assume that the manager maximizes the price per share for the existing shareholders that hold their shares until the end of period 2. We do not incorporate other agency problems in the model.

We capture potential time-to-build aspects associated with the production process by considering two polar cases: (i) investment in period 1 or period 2 is equally productive (no time-to-build), and (ii) investment in period 2 is completely unproductive (severe time-to-build). The second case describes industries in which cost-effective investment in new plants must begin many years before production, that is, in period 1 not period 2. For example, it is much less costly to build a new aircraft assembly plant over a multi-year period than building it in one year.

We start by analyzing the investment decision. The firm chooses the level of investments, I_1, and $I_2 \in [0, \infty)$, with a gross product $\alpha f(I_1 + g(I_2))$ in period 2 where $g(.)$ captures the (potential) time-to-build considerations. The marginal productivity of investment in the project is determined by $\alpha = \{\overline{\alpha}, \underline{\alpha}\}$. When demand due to demographics is high, α is high: $\alpha = \overline{\alpha}$; when demand due to demographics is low, α is low: $\alpha = \underline{\alpha} < \overline{\alpha}$. We assume that the production function is increasing and concave: $f'(I) > 0$ and $f''(I) < 0$ for all $I \geq 0$. To guarantee positive and finite investment for each project, we assume standard limiting conditions: $\lim_{I \to 0} f'(I) = \infty$ and $\lim_{I \to \infty} f'(I) = 0$. For convenience, we consider two limiting cases for $g(I)$. In the absence of time-to-build aspects, we let $g(I) = I$ so that there is no

[5] This mistake in expectations is an error in the perception of the average return for the project. It is not related to any misperception of the risk properties associated with the project.

reduction in the marginal productivity of investment even if the investment is implemented in period 2. In the presence of time-to-build considerations, we let $g(I) = 0$ to eliminate productive investment in the second period due to the prohibitive cost of delayed investment.

The manager uses internal funds or raises external finance (equity) in period 1 or 2 to raise sufficient funds for the investments I_1, and I_2. In our simplified set-up, equity is the only financial instrument that is affected by the limited foresight horizon of the investor. We discuss an extension with riskless debt at the end of this section. In period 1, the firm has cash C available and N shares outstanding. We assume that the financing constraints are only binding when demand is high. The firm always has enough cash to undertake the first-best investment with low demand $\underline{\alpha}$, but not enough cash to undertake the first-best investment with high demand $\overline{\alpha}$ without some equity issuance. This assumption simplifies the analysis without altering the basic insights of the model.

The firm can issue n_1 shares in period 1 (at price P_1) and n_2 shares in period 2 (at price P_2). The equity issuance in either period can be negative, that is, we allow the firm to repurchase equity. We assume that there is a maximum amount of total equity issuance or repurchases: $0 < \underline{N} \leq N + n_1 + n_2 \leq \overline{N}$, with $\underline{N} < \overline{N}$. We impose a similar constraint in period 1: $\underline{N} \leq N + n_1 \leq \overline{N}$. We select $\overline{N}$ to be large enough so that it is always possible to issue enough equity to finance the first best levels of investment, however it may not be optimal for the manager to do so. These technical assumptions rule out infinite share issuance and complete share repurchase. Finally, we assume that the manager incurs an extremely small fixed cost K each time equity is issued or repurchased. This technical assumption simplifies the analysis in the cases in which the firm is indifferent with respect to equity issuance.

The manager maximizes the price per share of the firm for the long-term shareholders, that is, total firm value scaled by the number of shares outstanding at the end of period 2. The firm's value is the sum of the initial cash holdings C, the equity raised in the two periods, $n_1P_1 + n_2P_2$, plus the value of the investment, $\alpha f\left(I_1 + g\left(I_2\right)\right)$, net of the investment expense, $I_1 + I_2$. The interest rate between the two periods is normalized to zero. The manager's maximization problem is

$$\max_{n_1,n_2,I_1,I_2} \frac{1}{N+n_1+n_2}\left(C+n_1P_1+n_2P_2+\alpha f\left(I_1+g\left(I_2\right)\right)-I_1-I_2\right). \tag{1}$$

$$\begin{aligned} s.t.\ I_1 &\leq C+n_1P_1, \\ I_1+I_2 &\leq C+n_1P_1+n_2P_2, \\ \underline{N} &\leq N+n_1+n_2 \leq \overline{N}, \\ \underline{N} &\leq N+n_1 \leq \overline{N}. \end{aligned}$$

While the manager knows the realization of the demand parameter α, investors in period 1 neglect demographic factors and make a forecast $\widehat{\alpha}$, with $\underline{\alpha} \leq \widehat{\alpha} \leq \overline{\alpha}$. This assumption captures the (potential) short-sightedness of the investors. In period 2, investors and managers agree about the level of demand, since investors observe α directly.

We assume that the manager extracts all the surplus from outside investors. Hence, we compute the highest prices P_1 and P_2 at which outside investors are willing to buy shares of the company. Investors in period 1 are willing to purchase shares if

$$P_1 = \frac{1}{N+n_1}\left(C+n_1P_1+\widehat{\alpha}f\left(I_{1,\widehat{\alpha}}+g\left(I_{2,\widehat{\alpha}}\right)\right)-I_{1,\widehat{\alpha}}-I_{2,\widehat{\alpha}}\right),$$

where $I_{1,\widehat{\alpha}}$ and $I_{2,\widehat{\alpha}}$ are the levels of investment consistent with the (potentially incorrect) demand forecast $\widehat{\alpha}$ in period 2. In the absence of time-to-build aspects ($g\left(I\right)=I$), we assume that the predicted levels of investment in the long-term project, $I_{1,\widehat{\alpha}}$ and $I_{2,\widehat{\alpha}}$ satisfy the equation $\widehat{\alpha}f'\left(I_{1,\widehat{\alpha}}+I_{2,\widehat{\alpha}}\right)-1=0$. In the presence of time-to-build considerations ($g\left(I\right)=0$), we assume that the predicted levels of investment in the long-term project, $I_{1,\widehat{\alpha}}$ and $I_{2,\widehat{\alpha}}$ satisfy the equations $\widehat{\alpha}f'\left(I_{1,\widehat{\alpha}}\right)-1=0$ and $I_{2,\widehat{\alpha}}=0$. These conditions define the first-best levels of investment for the project in each of the relevant cases if the true demand level is $\widehat{\alpha}$.

In period 2, investors are willing to purchase shares if

$$P_2 = \frac{1}{N+n_1+n_2}\left(C+n_1P_1+n_2P_2+\alpha f\left(I_{1,\alpha}+g\left(I_{2,\alpha}\right)\right)-I_{1,\alpha}-I_{2,\alpha}\right),$$

where $I_{1,\alpha}$ is the level of investment correctly observed by investors at the end of period 1 and

$I_{2,\alpha}$ is the forecast of investment in the second period that is consistent with the correct demand α. We define $V_\alpha = \alpha f\left(I_{1,\alpha} + g\left(I_{2,\alpha}\right)\right) - I_{1,\alpha} - I_{2,\alpha}$ and $V_{\widehat{\alpha}} = \left(\widehat{\alpha} f\left(I_{1,\widehat{\alpha}} + g\left(I_{2,\widehat{\alpha}}\right)\right) - I_{1,\widehat{\alpha}} - I_{2,\widehat{\alpha}}\right)$ to simplify notation and solve the two equations for the levels of P_1 and P_2: $P_1 = N^{-1}\left(C + V_{\widehat{\alpha}}\right)$ and $P_2 = \left(N + n_1\right)^{-1}\left(C + n_1 P_1 + V_\alpha\right)$.

First, we analyze investment and equity issuance in period 2 (with no mispricing) and then we consider equity issuance in period 1 (with mispricing).

Period 2. After substituting in the solution for P_2 and rearranging, the problem of the manager in period 2 is

$$\max_{n_2, I_2} \frac{1}{N + n_1}\left(C + n_1 P_1\right) + \frac{1}{N + n_1 + n_2}\left(\left(\frac{n_2}{N + n_1}\right) V_\alpha + \alpha f\left(I_{1,\alpha} + g\left(I_2\right)\right) - I_{1,\alpha} - I_2\right). \quad (2)$$

The first-order condition of this problem with respect to the level of investment in the second period is equivalent to

$$\alpha f'\left(I_{1,\alpha} + g\left(I_2^*\right)\right) g'\left(I_2^*\right) - 1 = 0.$$

Given our assumptions about $f(.)$ and $g(.)$, there is a unique solution for I_2^*. If $g(I) = I$, the solution is the first-best level of investment given by $\alpha f'\left(I_{1,\alpha}^* + I_2^*\right) - 1 = 0$. Alternatively, if $g(I) = 0$, the solution is still the first-best level of investment where $I_2^* = 0$ (a corner solution).

In either case the solution for I_2^* does not depend on the issuance decision n_2^*., To solve for the optimal n_2^* we substitute $I_2 = I_2^*$ and $I_{2,\alpha} = I_2^*$ in expression (2). The manager's problem simplifies to

$$\max_{n_2} \frac{1}{N + n_1}\left(C + n_1 P_1 + \alpha f\left(I_{1,\alpha} + g\left(I_2^*\right)\right) - I_{1,\alpha} - I_2^*\right),$$

which is independent of the equity issuance n_2. Hence, optimal equity issuance in period 2 is determined only by the need to raise sufficient funds to finance the optimal level of investment in period 2. This result is not surprising because there is no divergence in expectations in the last period and there are no other capital market distortions. Given the small fixed cost of share issuance (repurchase) K, the firm does not raise equity in the second period ($n_2^* = 0$) if it already has enough funds to finance the investment, that is, if $I_2^* + I_{1,\alpha} - C - n_1 P_1 < 0$ or if $I_2^* = 0$. Otherwise, the firm issues a sufficient number of new shares to ensure that

$n_2^* P_2 \geq I_2^* + I_{1,\alpha} - C - n_1 P_1$.

Period 1. Using the solution for I_2^*, we solve for the optimal equity issuance (repurchase) decision in period 1. After substituting in the values for P_1 and P_2 and rearranging, the maximization problem is

$$\max_{n_1, I_1} \frac{1}{N}\left(C + V_{\widehat{\alpha}}\right) + \frac{1}{N + n_1}\left(\alpha f\left(I_1 + g\left(I_2^*\right)\right) - I_1 - I_2^* - V_{\widehat{\alpha}}\right). \tag{3}$$

The first term in expression (3) is the value of the company according to the outside investors (based on incorrect expectation that the demand shift will be $\widehat{\alpha}$). The second term captures the value to the manager of exploiting the biased beliefs of investors by issuing or repurchasing equity via n_1. Note that the issuance (repurchase) decision in period 2 is irrelevant for the maximization problem in period 1.We consider the standard case first and then proceed to the case with time-to-build aspects.

If $g(I) = I$ (no time-to-build), the optimal level of investment in period 1 for the long-term project satisfies $\alpha f'\left(I_1^* + I_2^*\right) - 1 = 0$. This first-best level of investment, $I_1^* + I_2^*$, is always attained because the manager can raise sufficient equity in the second period to finance the optimal investment. Hence, in the absence of time-to-build aspects, the expected value of the investment opportunity is independent of the decision to issue or repurchase equity in the first period. Given the assumptions about $f(.)$, the optimal investment policy, $I_1^* + I_2^*$, in the project is an increasing function of α.

Next, we determine the optimal level of equity issuance/repurchase. Since the first term of (3) is not a function of n_1, the solution only depends on the numerator of the second term, $\alpha f\left(I_1^* + I_2^*\right) - I_1^* - I_2^* - V_{\widehat{\alpha}}$ (substituting I_1^* for I_1). If there is high future demand and shortsighted investors, $\alpha = \overline{\alpha} > \widehat{\alpha}$, this term is positive and the manager chooses to minimize $N + n_1$. Since the company is undervalued, the manager repurchases as many shares as possible in period 1, $n_1^* = \underline{N} - N$, and then issues equity in the second period to finance the optimal level of investment. If there is low future demand and shortsighted investors, $\alpha = \underline{\alpha} < \widehat{\alpha}$, the term is negative and the manager chooses to maximize $N + n_1$. Because the company is overvalued, the manager issues as much equity as possible, $n_1^* = \overline{N} - N$ and there is no need to issue shares in the second period to finance the optimal level of investment. If $g(I) = I$, the optimal level of investment in period 1 for the long-term project satisfies $\alpha f'(I_1^* + I_2^*) - 1 = 0$ and given the functional form of $f(.)$, the optimal investment policy, $I_1^* + I_2^*$, in the project is an increasing function of α.

If $g(I) = 0$ (time-to-build), then $I_2^* = 0$ and the manager maximizes

$$\max_{n_1, I_1} \frac{1}{N}(C + V_{\widehat{\alpha}}) + \frac{1}{N + n_1}(\alpha f(I_1) - I_1 - V_{\widehat{\alpha}}). \tag{4}$$

where the first-best level of investment is characterized by $\alpha f'\left(I_1^{FB}\right) - 1 = 0$. When demand is low ($\alpha = \underline{\alpha}$), the term $\alpha f(I_1) - I_1 - V_{\widehat{\alpha}}$ is negative. The manager issues as much equity as possible ($n_1^* = \overline{N} - N$) and selects the first-best investment level I_1^{FB}. When demand is high, ($\alpha = \overline{\alpha}$), the manager would like to repurchase shares up to $n_1^* = \underline{N} - N$. However, this action would make it impossible to undertake the first-best investment I_1^{FB} because the firm does not have sufficient cash on hand to finance the first best level of investment when demand is high. In this case, there is a trade-off between exploiting mispricing by repurchasing equity and financing the investment opportunity by issuing (or not repurchasing) equity in the first period. Hence, the motivation to repurchase shares due to market timing will generally be attenuated by the need to finance investment in the presence of time-to-build aspects. This trade-off implies that it is not obvious if investment is greater when demand is high than when demand is low. However, the investment opportunity and any potential mispricing are both quantitatively related to the magnitude of the demand shift and we are able to show that investment is greater if demand is high (see appendix).

The next proposition summarizes these results. We use the notation ST to indicate the standard case where $g(I) = I$ and the notation TB to indicate time-to-build considerations where $g(I) = 0$.

Proposition 1 (Inattentive investors). *(i) In the case with high demand ($\alpha = \overline{\alpha} > \widehat{\alpha}$) and no time-to-build ($g(I) = I$), the manager repurchases shares in period 1 and issues shares in period 2: $n_{1,ST}^* = \underline{N} - N < 0$ and $n_{2,ST}^* > 0$. (ii) In the case with high demand ($\alpha = \overline{\alpha} > \widehat{\alpha}$) and time-to-build ($g(I) = 0$), the manager repurchases (weakly) fewer shares of the company* *compared to case (i) and does not issues shares in period 2:* $n^*_{1,TB} \geq n^*_{1,ST}$ *and* $n^*_{2,TB} = 0$. *(iii) In either case with low demand* ($\alpha = \underline{\alpha} < \widehat{\alpha}$)*, the manager issues shares in period 1 and does not issue in period 2:* $n^*_{1,ST} = n^*_{1,TB} = \overline{N} - N > 0$ *and* $n^*_{2,ST} = n^*_{2,TB} = 0$.*(iv) Total investment* ($I^*_1 + I^*_2$) *is greater in the case with high demand* ($\alpha = \overline{\alpha}$) *than in the case with low demand* ($\alpha = \underline{\alpha}$).

Restating this discussion brings us to our empirical tests. Demand shifts in the near future should be positively related to net equity issuance, but demand shifts in the more distant future should be negatively related to net equity issuance. The second relationship should be attenuated by time-to-build considerations. Finally, investment should increase with the demand shift in the absence of time-to-build considerations

Attentive Investors. So far, we considered the case of short-sighted investors, for which $\underline{\alpha} < \widehat{\alpha} < \overline{\alpha}$. We also consider the case in which investors are fully aware of the demand shift α. The solution for the investment I^*_2 and equity issuance n^*_2 in period 2 do not change. The maximization problem in period 1 becomes

$$\max_{n_1, I_1} \frac{1}{N} \left(C + \alpha f \left(I_1 + g \left(I^*_2 \right) \right) - I_1 - I^*_2 \right) \tag{5}$$

In this case investors have correct expectations for demand in the first period, and therefore, investors also have correct expectations of investment. Hence, the firm has no incentive to issue (or repurchase) equity in period 1, except to finance the investment. If $g(I) = I$, the manager will raise equity in either period 1 or period 2 but not in both periods when demand is high. If $g(I) = 0$, the manager will raise equity in period 1 when demand is high. If demand is low, investment is financed internally in either case. Because investment is first-best, expression (4) and the functional form of $f(.)$ imply that the optimal level of investment, $I^*_1 + I^*_2$, must be an increasing function of α. The predictions are summarized in the next Proposition.

Proposition 2 (Fully attentive investors). *(i) In the case of high demand* ($\alpha = \overline{\alpha} = \widehat{\alpha}$)*, there is positive issuance in one of the two periods* ($n^*_1 > 0$ *or* $n^*_2 > 0$)*; in the presence of time-to-build, there is issuance in the first period only. (ii) In the case of low demand* ($\alpha = \underline{\alpha} = \widehat{\alpha}$)*, there is no equity issuance* ($n^*_1 = n^*_2 = 0$)*. (iii) Total investment* ($I^*_1 + I^*_2$) *is greater in the* *case with high demand ($\alpha = \overline{\alpha}$) than the case with low demand ($\alpha = \underline{\alpha}$).*

For attentive investors, the only motive to issue equity is capital budgeting. Both equity issuance and investment respond positively to the demand shift α. Equity issuance can increase well in advance of the demand shift (period 1) or immediately before the demand shift (period 2) if time-to-build is not an important consideration.

Extensions. We briefly discuss possible extensions and simplifying assumptions. It is straightforward to generalize the model to allow issuance and/or repurchases of (correctly priced) riskless debt in either period. Since riskless debt is issued for capital budgeting rather than for market timing reasons, the main differential prediction would occur for high demand due to demographics ($\alpha = \overline{\alpha}$). Instead of raising equity to finance investment, the firm could raise debt in either period. Hence, we test the additional prediction that debt responds positively to demand shifts due to demographics in Section 4.8.

We also assumed that the demand for equity is not downward sloping. Agency problems or more sophisticated versions of asymmetric information would induce additional capital market distortions and generate downward sloping demand curves. These factors would also distort the investment decision and the discussion of the model would become substantially more complicated. Optimal issuance and repurchase levels in the presence of mispricing would be determined by the shape of the demand curve rather than the technical assumption of a minimum and maximum number of shares. Nevertheless, we doubt that introducing these modifications would change the key insights.

3 Data

In this Section, we summarize the construction of the measures of demand growth due to demographics.[6] We also briefly summarize the results about abnormal return predictability using demographic information to motivate our test of market timing. Next, we provide summary statistics on the benchmark measures of equity issuance.

[6] See DellaVigna and Pollet (2007) for additional details regarding this procedure.

3.1 Demand Shifts Due to Demographics

To obtain demographic-based forecasts of demand growth by industry, we generate demographic forecasts and combine them with estimated age patterns in consumption by industry.

Demographic Forecasts. We combine data from the *Census* on cohort size, mortality, and fertility rates to form forecasts of cohort sizes. We use demographic information available in year t to forecast the age distribution by gender and one-year age groups for years $u > t$. We assume that fertility rates for the years $u > t$ equal the fertility rates for year t. We also assume that future mortality rates equal mortality rates in year t except for a backward-looking percentage adjustment. Using cohort size in year t and the forecasts of future mortality and fertility rates, we form preliminary forecasts of cohort size for each year $u > t$, which we the adjust for net migration. We compute an adjustment for net immigration by regressing the percentage difference between the actual cohort size and the preliminary forecasted cohort size formed the year before, on a constant. We produce these adjustment coefficients separately for each 10-year age group using data from the most recent five-year period prior to year t.

We define $\hat{A}_{g,u|t} = \left[\hat{A}_{g,0,u|t},\ \hat{A}_{g,1,u|t},\ \hat{A}_{g,2,u|t}, ...\right]$ as the forecasted age distribution. $\hat{A}_{g,j,u|t}$ is the number of people of gender g alive at u with age j forecasted using information available at t. $A_{g,j,u}$ is the actual cohort size of gender g alive at u with age j. These estimates, we can forecast the actual population growth rate over the next 5 years, $\log A_{g,j,t+5} - \log A_{g,j,t}$, with an R^2 of 0.83. The forecasts 5 to 10 years in the future are only slightly less precise. Our forecasts also closely parallel publicly available demographic forecasts, in particular the Census Bureau population forecasts created using data from the 2000 Census.[7]

Age Patterns in Consumption. We use data from the *Survey of Consumer Expenditures, 1972-1973* and the 1983-1984 cohorts of the ongoing *Consumer Expenditure Survey* to estimate the age patterns in consumption. We cover all major expenditures on final goods included in the survey data. The selected level of aggregation attempts to distinguish goods with different age-consumption profiles. For example, within the category of alcoholic bever-

[7] We do not use the Census population forecasts because they are unavailable for many of the years in the sample.

ages, we separate beer and wine from hard liquor expenditures. Similarly, within insurance we distinguish among health, property, and life insurance expenditures.

In Figure 1, we illustrate the age profile for two goods using kernel regressions of household annual consumption on the age of the head of household[8]. Figure 1 plots the normalized expenditure on bicycles and drugs for the 1972-73 and 1983-84 surveys.[9] Across the two surveys, the consumption of bicycles peaks between the ages of 35 and 45. At these ages, the heads of household are most likely to have children between the ages of 5 and 10. The demand for drugs, instead, is increasing with age, particularly in the later survey. Older individuals demand more pharmaceutical products.

This evidence on age patterns in consumption supports three general statements. First, the amount of consumption for each good depends significantly on the age of the head of household. Patterns of consumption for most goods are not flat with respect to age. Second, these age patterns vary substantially across goods. Some goods are consumed mainly by younger household heads (child care and toys), some by heads in middle age (life insurance and cigars), others by older heads (cruises and nursing homes). Third, the age profile of consumption for a given good is quite stable across time. For example, the expenditure on furniture peaks at ages 25-35, whether we consider the 1972-73 or the 1983-84 cohorts. Taken as a whole, the evidence suggests that changes in age structure of the population have the power to influence consumption demand in a substantial and consistent manner.

Demand Forecasts. We combine the estimated age profiles of consumption with the demographic forecasts in order to forecast demand for different goods. For example, consider a forecast of toys consumption in 1985 made as of 1975. For each age group, we multiply the forecasted cohort sizes for 1985 by the age-specific consumption of toys estimated on the most recent consumption data as of 1975, that is, the 1972-73 survey. Next, we aggregate across all the age groups to obtain the forecasted overall demand for toys for 1985.

In Table 1, we present summary statistics on the consumption forecasts. Columns 2 and

[8] We use an Epanechnikov kernel with a bandwidth of 5 years of age for each consumption good and survey year.

[9] For each survey-good pair we divide age-specific consumption for good k by the average consumption across all ages for good k.

4 present the five-year predicted growth rate due to demographics, $\ln \hat{C}_{k,t+5|t-1} - \ln \hat{C}_{k,t|t-1}$, respectively for years $t = 1975$ and $t = 2000$. The bottom two rows present the mean and the standard deviation across goods of this measure. In each case, data from the most recent consumer expenditure survey is used. In 1975, the demand for child care and toys is low due to the small size of the 'Baby Bust' generation. The demand for most adult-age commodities is predicted to grow at a high rate (1.5-2 percent a year) due to the entry of the 'Baby Boom' generation into prime consumption age. In 2000 the demand for child-related commodities is relatively low. The aging of the 'Baby Boom' generation implies that the highest forecasted demand growth is for goods consumed later in life, such as cigars, cosmetics, and life insurance.

Demographic Industries. We also categorizes goods by their sensitivity to demographic shifts. For example, the demand for oil and utilities is unlikely to be affected by shifts in the relative cohort sizes, while the demand for bicycles and motorcycles depends substantially on the relative size of the cohorts aged 15-20 and 20-30, respectively. We construct a measure of Demographic Industries using information available at time $t-1$ to identify the goods where demographics shifts are likely to have the most impact. In each year t and industry k, we compute the standard deviation of the one-year consumption forecasts up to 15 years ahead given by $\left(\ln \hat{C}_{k,t+s+1|t-1} - \ln \hat{C}_{k,t+s|t-1}\right)$ for $s = 0, 1, ..., 15$. We define the set of Demographic Industries[10] in each year t as the 20 industries with the highest standard deviation of demand growth. In these industries, the forecasted aging of the population induces different demand shifts at different times in the future, enabling the estimation of investor horizon. Table 1 lists all industries and indicates which industries belong to the subset of demographics industries in 1975 (Column 3) and 2000 (Column 5). Column 6 summarizes the percentage of years in which an industry belongs to the Demographic Industries subsample. The Demographic Industries are associated with high demand by children (child care, toys) and by young adults (housing).

Return Predictability. The evidence supporting return predictability is summarized in

[10] Ideally, we would like to select industries in which demographics better predicts contemporaneous profitability or revenue growth. Unfortunately, this avenue is not feasible for two reasons. First, demographics is a small predictor of revenue and profit, so one would need a long time series to identify the industries with the highest predictive power. For univariate series with 20-30 observations, the estimation would be poor. Second and relatedly, it would be impossible to do such test in the early years of data without violating the requirement of only using backward-looking information.

Figure 2. This figure plots the coefficient of univariate regressions of abnormal annual industry stock returns in year t on forecasted demand growth due to demographics in year $t+h$. The panel regression includes up to 48 industries over the years 1974-2004. As Figure 2 shows, while contemporaneous demand shifts (h equal to 1 or 2) do not significantly forecast stock returns, demand shifts 5-10 years ahead (h equal to 5-10) significantly predicts returns.[11] We interpret this result as evidence that investors neglect forecastable determinants of fundamentals that are more than 5 years in the future. The abnormal return for an industry increases when the inattentive investors incorporate the upcoming demand shift 5 years in the future.[12]

3.2 Equity and Debt Issuance

IPOs. The first measure of equity issuance captures the decision of firms in an industry to go public. We construct the benchmark measure of IPOs as the share of traded companies in industry k and year t that are new equity listings in year t. The measure of new equity listings is available for the full sample (1974-2004) for the large majority of the industries. The average share of new listings ranges from 0.011 (Books: College Texts) to 0.126 (Cruises). As an alternative measure, we also use the share of companies in industry k and year t that undertake an IPO according to data from Jay Ritter. The main disadvantage of this alternative measure is that the data is available only from 1980 until 2003. During the sample in which both measures exist, the correlation between the two measures is .8228.

Net Equity Issuance. The measures of equity issuance for public companies in year t and industry k are based on net equity issuance in year t scaled by industry book value of assets in year $t-1$ (Frank and Goyal, 2003). The measures are available for the entire sample period for most industries, even though the number of companies included in the industry is smaller than the corresponding number for the IPO measure, given the additional data requirement that the company is in Compustat as well as CRSP. We define the measure of substantial equity issuance as the fraction of companies in industry k that in a given year t that have net

[11] The the standard errors in Figure 2 are estimated using the methodology described in Section 4.

[12] More detailed evidence supporting abnormal return predictability is available in DellaVigna and Pollet (2007).

equity issuance greater than three percent of the book value of assets. This threshold, albeit arbitrary, allows us to eliminate equity issues that are part of ordinary transactions, such as executive compensation. The mean of this variable is .108, with a standard deviation of .190. Similarly, we define a measure of substantial equity repurchases as the fraction of companies in industry k that in a given year t that have net equity repurchases greater than three percent of the book value of assets. The mean of this variable is .067, with a standard deviation of .164.

Net Debt Issuance. The measures of debt issuance for public companies in year t and industry k are based on the net long-term debt issuance in year t scaled by industry book value of assets in year $t-1$. We define measures of substantial debt issuance and substantial debt repurchases following the same approach described for equity issuance.

4 Empirical Analysis

4.1 Baseline Specification

In the baseline specification we regress the equity issuance variables on the forecasted growth rate of demand due to demographics from t to $t+5$ (the present and the near future) and $t+5$ to $t+10$ (the further future). The specification of the regression is

$$e_{k,t+1} = \gamma + \delta_0[\hat{c}_{k,t+5|t-1} - \hat{c}_{k,t|t-1}]/5 + \delta_1[\hat{c}_{k,t+10|t-1} - \hat{c}_{k,t+5|t-1}]/5 + \beta_m e_{m,t+1} + \beta_b mb_{k,t+1} + \varepsilon_{k,t} \tag{6}$$

Since the consumption growth variables are scaled by 5, the coefficients δ_0 and δ_1 represent the average increase in issuance for one percentage point of additional annualized growth in demographics at the two different horizons. (The forecasts of consumption as of time t only use information available in period $t-1$.) The specification controls for market-wide patterns in equity issuance, $e_{m,t+1}$, and the industry market-to-book ratio, $mb_{k,t+1}$.[13]

In this panel setting it is unlikely that the errors from the regression are uncorrelated across industries and over time because there are persistent shocks that affect multiple industries at

[13] We also show in Table 4 that including lagged profitability and lagged investment does not affect the results.

the same time. We allow for heteroskedasticity and arbitrary contemporaneous correlation across industries by calculating standard errors clustered by year. In addition, we correct these standard errors to account for autocorrelation in the error structure.[14]

Let X be the matrix of regressors, θ the vector of parameters, and ε the vector of errors. The panel has T periods and K industries. Under the appropriate regularity conditions, $\sqrt{\frac{1}{T}}(\hat{\theta} - \theta)$ is asymptotically distributed $N(0, (X'X)^{-1} S(X'X)^{-1})$ where $S = \Gamma_0 + \sum_{q=1}^{\infty}(\Gamma_q + \Gamma_q')$ and $\Gamma_q = E[(\sum_{k=1}^{K} X_{kt}\varepsilon_{kt})'(\sum_{k=1}^{K} X_{kt-q}\varepsilon_{kt-q})]$. The matrix Γ_0 captures the contemporaneous covariance, while the matrix Γ_q captures the covariance structure between observations that are q periods apart. While we do not make any assumptions about contemporaneous covariation, we assume that $X_{kt}'\varepsilon_{kt}$ follows an autoregressive process given by $X_{kt}'\varepsilon_{kt} = \rho X_{kt-1}'\varepsilon_{kt-1} + \eta_{kt}'$ where $\rho < 1$ is a scalar and $E[(\sum_{k=1}^{K} X_{kt-q}\varepsilon_{kt-q})'(\sum_{k=1}^{K} \eta_{kt})] = 0$ for any $q > 0$.

These assumptions imply $\Gamma_q = \rho^q \Gamma_0$ and therefore, $S = [(1+\rho)\,/\,(1-\rho)]\Gamma_0$. (Derivation and details are in DellaVigna and Pollet, 2007) The higher the autocorrelation coefficient ρ, the larger the terms in the matrix S. Since Γ_0 and ρ are unknown, we estimate Γ_0 with $\frac{1}{T}\sum_{t=1}^{T} X_t'\hat{\varepsilon}_t\hat{\varepsilon}_t' X_t$ where X_t is the matrix of regressors and $\hat{\varepsilon}_t$ is the vector of estimated residuals for each cross-section. We estimate ρ from the pooled regression for each element of $X_{kt}'\hat{\varepsilon}_{kt}$ on the respective element of $X_{kt-1}'\hat{\varepsilon}_{kt-1}$.

We use the set of Demographic Industries for the years 1974-2004 as the baseline sample for the paper. As discussed above, the Demographic Industries are more likely to be affected by demographic demand shifts.

4.2 IPO Results

In Table 2, we estimate specification (6) for the share of new equity listings, the benchmark measure of IPOs. Columns 1 through 4 present the estimates for the sample of Demographic Industries. In the specification without industry or year fixed effects (Column 1), the impact of demographics on new equity listings is identified by both between- and within-industry vari-

[14] This method is more conservative than clustering by either industry or year. In the empirical specifications that follow, the standard errors computed with either of these methodologies are almost uniformly lower than our standard errors.

ation in demand growth. The coefficient on short-term demographics, $\hat{\delta}_0 = 3.35$, is marginally significantly different from zero, while the coefficient on long-term demographics, $\hat{\delta}_1 = -4.84$, is significantly different from zero. Introducing the controls for the industry market-to-book ratio $mb_{k,t}$ and for the aggregate share of new listings $e_{m,t}$ (Column 2) reduces the effect of long-term demographics to a marginally significant $\hat{\delta}_1 = -2.49$ and the effect of short-term demographics becomes insignificant. The control for the aggregate share of new listings is highly significant and close to 1, suggesting the importance of controlling for market waves in IPOs. In this and the subsequent specifications in Table 2, the estimate of ρ is approximately 0.17, resulting in a proportional correction for the standard errors of $\sqrt{(1+\hat{\rho})/(1-\hat{\rho})} = 1.19$.

In Column 3 we introduce industry fixed effects. In this case, the identification depends only on within-industry variation in demand growth. The demand growth in the near-future has a marginally significant positive effect on the share of new listings ($\hat{\delta}_0 = 2.45$), while the demand growth in the further future has a significant negative effect ($\hat{\delta}_1 = -3.07$). We obtain similar results in Column 4, where we introduce year fixed effects. In this specification, the identification depends on within-industry variation in demand growth after controlling for common time-series patterns.[15]

For the specifications in Columns 2-4, a one percent annualized increase in demand from year 0 to 5 increases the share of net equity issues by about 2.5 percentage points from an average of 6.33 percentage points. (A one percentage point increase in demand growth corresponds approximately to a 1.7 standard deviations.[16]) A one percentage point annualized increase in demand from year 5 to 10 decreases the share of net equity issues by about 3 percentage points, a significant and economically large effect. While this effect is large, we note that a decrease of .5 percentage points is inside the confidence interval for the coefficient estimate.

In Columns 5 and 6 we use the alternative measure of IPOs based on the share of IPOs according to data from Jay Ritter. Similar to the results obtained with the benchmark measure, we find that long-term demand growth due to demographics is negatively related to the share

[15] We find quantitatively similar results using the Fama-MacBeth regression methodology. This alternative approach provides results that are largely consistent with the evidence from panel regressions.

[16] For this sample, the mean forecasted demand growth 0-5 (respectively, 5-10) years ahead is .0139 (.0118), with standard deviation .0059 (.0059).

of IPOs. While the coefficient estimate is positive for short-term demand growth due to demographics, this effect is not significant.

Finally, in Columns 7 and 8 we present the results for the benchmark measure of IPOs, but for the sample of non-demographic industries. The coefficient estimates are similar but the standard errors are about twice as large, despite the higher number of observations. For this set of industries, the demographic shifts are not important enough determinants of demand. If we group the two samples together and consider the sample of all industries (not shown), the results are slightly stronger than those for the demographic sample.

To summarize, the impact of demand shifts on the share of new equity listings depends on the horizon of the demand shifts. Demand shifts occurring in the near future increase the share of IPOs, consistent with capital budgeting, although this effect is not always significant. Demand shifts occurring further in the future, instead, significantly decrease the share of IPOs, consistent with market timing. In both cases, the effect is economically large.

4.3 Net Equity Issuance Results

In Table 3, we estimate specification (6) for the measures of net equity issuance by existing firms in the sample of Demographic Industries.[17]

In Columns 1-3 we present the results for the measure of large equity issues, the share of companies in an industry with net issuance above three percent of assets. In the specification without industry or year fixed effects (Column 1), the coefficient on short-term demographics is positive but insignificant ($\hat{\delta}_0 = 4.05$), while the coefficient on long-term demographics is significantly negative ($\hat{\delta}_1 = -7.24$). Once we introduce the controls for the industry market-to-book ratio $mb_{k,t+1}$ and aggregate net equity issuance $e_{m,t+1}$ as well as industry fixed effects (Column 2), the coefficient estimates for both the short-term demographics and the long-term demographics are statistically significant. In this and the subsequent specifications in Table 6, the estimate of ρ varies between 0 and .30, for an average of 0.15, resulting in a proportional correction for the standard errors of $\sqrt{(1+\hat{\rho})\,/\,(1-\hat{\rho})} = 1.16$. In Column 3 we introduce year

[17] The results are qualitatively similar but much imprecisely estimated for the sample of Non-Demographic Industries.

fixed effects, which lowers the coefficient on short-term demographics considerably, rendering it insignificant.

In Columns 4-6 we present the results for the large equity repurchases, the share of companies in an industry with net repurchases above 3 percent of assets. The qualitative results are, as predicted, the opposite sign compared to the estimates for large equity issuance. However, the estimates are less precisely estimated. Near-term demographic shifts are not significantly related to repurchases. Long-term demographic shifts increase the repurchases in Columns 4 and 5 but not in Column 6.

Finally, in Columns 7 and 8 we analyze the continuous measure of net equity issuance. We find evidence that near-term demographic shifts increase net equity issuance and long-term demographic shifts decrease net equity issuance. In results not shown, we revisit the specifications in Columns 7 and 8 using an alternative measure of net equity issuance in the spirit of Baker and Wurgler (2002) defined as the change in book equity minus the change in retained earnings (scaled by lagged assets) and the results are qualitatively similar.

To summarize, the evidence matches the predictions of the model and is consistent with the findings for new listings. Demand shifts occurring in the near future increase net equity issuance, consistent with capital budgeting. Demand shifts occurring in the distant future significantly decrease the net equity issues by both decreasing issuance and increasing repurchases, consistent with market timing. In both cases, the estimates are economically large.

4.4 Combined Issuance Results

Since the results for new equity listings and the results and large additional equity issuance are consistent, we introduce a combined measure of equity issuance. This measure provides additional power and reduces the number of specifications we consider in the subsequent analysis.

The combined measure of equity issuance is defined as the fraction of companies in an industry that issued equity either through an IPO or through a secondary issuance. More precisely, the dependent variable is the average of the benchmark measure of IPOs used in Columns 1 through 4 of Table 2 and the measure of large equity issuance used in Columns 1 through 3 of Table 3.

The results for combined measure of equity issuance match the findings for each of the constituent measures (Columns 1 through 3 of Table 4).. The improved statistical power associated with the combined measure leads to the more consistent rejection of the null hypothesis for both short-term and long-term demographics significant.

In Columns 4-6, we provide evidence regarding the appropriateness of the standard errors employed in the paper. In particular, we replicate the regressions in the first three columns using the double-clustering procedure described by Thompson (2006). In general, the standard errors based on Thompson (2006) are similar to those in Columns 1 through 3. In most regressions the standard errors for the coefficient on long-term demand growth are more conservative using our approach than those using the double-clustering procedure.

In the last two columns of Table 4 we introduce additional controls for lagged accounting return on equity and lagged investment even though these variables are themselves affected by the demographic shifts. Indeed, investment should be endogenously related to investment opportunities (and perhaps mispricing). Profitability is also related to demand shifts as documented in DellaVigna and Pollet (AER, 2007), and therefore, it may capture a portion of the exogenous information embedded in demographics. Neither of these control variables have an appreciable impact on the point estimates or standard errors of the coefficients for short-term or long-term demand growth.

4.5 Graphical Evidence

Using the same combined issuance measure, we present graphical evidence on how equity issuance respond to demographic shifts at different time horizons.

For different time horizons h, we estimate the regression:

$$e_{k,t+1} = \lambda + \delta_H[\hat{c}_{k,t+h+1|t-1} - \hat{c}_{k,t+h|t-1}] + \beta_m e_{m,t+1} + \beta_b mb_{k,t+1} + \eta_k + \varepsilon_{k,t} \tag{7}$$

for the sample of Demographic Industries, for horizon h between 0 and 13 years. The coefficient δ_H measures the extent to which demand growth h years ahead forecasts stock returns in year $t + 1$. The specification controls for market-wide patterns in issuance, as captured by $e_{m,t+1}$, for industry market-to-book, as captured by $mb_{k,t+1}$, and for industry fixed effects. This specification differs from the main specification in the paper in two ways: (i) we do not require the short-term effect to occur within 5 years and the long-term effect to occur 5 to 10 years ahead, but estimate the effect at different horizons; (ii) the specification is a univariate regression of equity issuance on demographic shifts h years ahead. Since demand shifts at different horizons h are positively related, the estimates capture the weighted impact at different horizons.

Figure 3 presents the results of the estimation of (7) Demand growth due to demographics 0 to 1 years ahead is associated with a small (not significant) increase in IPOs according to the benchmark measure. Demand growth due to demographics 2 or more years ahead, instead, has a negative impact on IPO issuance. The impact is most negative (and statistically significant) for demand shifts 7 to 9 years ahead. Demographic shifts more than 10 years in the future have a smaller (though still negative) impact on IPO decisions.

Overall, the pattern in this figure is remarkably consistent with the pattern for abnormal returns in Figure 2: the horizons for which returns display significant positive predictability (4-8 years ahead) are approximately the same horizons for which we observe the significant negative impact on equity issuance, consistent with market timing.

This figure does not provide any statistical support for capital budgeting. However, this lack of evidence should not be particularly surprising because demand growth at different horizons in the future are positively correlated with each other. If market timing is a stronger motivation than capital budgeting (as suggested by the coefficient magnitudes in Table 4), the negative impact of market timing will swamp the capital budgeting effect in a univariate setting even for short term demand growth.

4.6 Time-To-Build

The model indicates that the impact of both long-term and short-term demographics is attenuated by time-to-build. The investment required to expand production in response to future demographic demand could take several years. In the empirical specifications above, the proxy for short-term investment opportunities includes a time-to-build of up to five years. In some industries, however, the time required for investment could be longer. In these industries the lengthy time-to-build will attenuate the negative relationship between the long-term demand due to demographics and security issuance. Essentially, long-term demand captures not only the market timing (which induces a negative relation), but also the capital budgeting (which induces a positive relation). In addition, in the presence of a substantial time-to-build, short-term demand is unrelated to equity issuance because it is difficult to build additional capacity quickly enough to take advantage of a positive demand shift.

To provide evidence on the importance of time-to-build, we separate the sample based on a proxy of time-to-build. We measure the amount of work in progress (Compustat data item 77) divided by the book value of the firm. Firms that have a higher share of work in progress are more likely to have a lengthy production process and greater difficulty adjusting capacity rapidly. We split observations in two groups, above and below the median value of .005.

In Columns 1 through 4 of Table 5 we present the results. Indeed, for the high time-to-build industries (Columns 1-2), both coefficient estimates are closer to zero and not statistically significant. For the low time-to-build industries (Columns 3-4), we find coefficient estimates that are larger (in absolute value) than those for the benchmark sample, and long-term demand is statistically significant. Time-to-build appears to modify how firms respond to demand shifts in a manner that is consistent with the predictions of the model.

4.7 Industry Concentration

The impact of a demand shift on equity issuance could depend on the market structure of each industry. In a perfectly competitive industry there is no impact on abnormal profitability, and hence, no possibility of mispricing associated with long-term demand shifts. At the other extreme, a monopolist with substantial market power generates abnormal profits from a positive demand shift, and therefore, demand in the distant future generates mispricing in the presence of limited attention. Hence, evidence of market timing should be more substantial for industries with high market power. Similarly, the evidence of capital budgeting may also be more considerable for industries with high market power because the potential to earn abnormal profits motivates the expansion of capacity. We address these issues issue by estimating how the impact of demand shifts on equity issuance varies with the market power.

We use the concentration ratio C-4 from the Census of Manufacturers to measure market power. This ratio is the fraction of revenue within an industry produced by the 4 largest companies (including privately held firms). This measure is available for firms with 4-digit SIC codes between 2000 and 3999. We define the measure for each industry as a weighted average of the C-4 ratio for the SIC codes included in the definition of each industry. We use the concentration ratios from 1972 (or 1970 if the 1972 data is missing) to guarantee that the information about industrial organization is collected before the beginning of the sample period. Among the 31 industries with concentration data the median C-4 ratio is 0.35.

We estimate the impact for industries with above-median and below-median concentration ratios separately. The industries with above-median concentration (Columns 5 and 6) have statistically significant and economically large evidence of both market timing and capital budgeting. For the industries with below-median concentration (Columns 7 and 8), the impact of demographic shifts, while directionally consistent, is smaller and not statistically significant.

4.8 Net Debt Issuance Results

In Table 6, we estimate specification (6) for the measures of debt issuance in the sample of Demographic Industries. We present the findings for large debt issuance (Columns 1 through 3); for large debt repurchases (Columns 4 through 6); and for the results using the continuous measure of net issuance (Columns 7 and 8). The impact of macroeconomic conditions on debt issuance, such as the yield spread and the credit spread, will be captured by the control for market-wide activity or by the time fixed effects.

The sign of the coefficient estimates for demand shifts in the near future is usually consistent with capital budgeting but none of the estimates are statistically significant. The statistical evidence that demand shifts in the distant future are related to debt policy is more mixed. Long term demographics are not statistically related to large debt issuance (Columns 1 through 3) or the continuous measure of net debt issuance (Columns 7 and 8). In Columns 4 through 6 debt repurchases are negatively related to demand shifts in the distant future. This result could support market timing if debt is used as a substitute for equity, that is, undervalued firms repurchase equity but do not repurchase debt due to financing constraints. Since market timing does not have a clear prediction about the relationship between long-term demand shifts and debt policy, this evidence is only suggestive.

4.9 Investment and R&D

In this Section, we provide evidence about the channels underlying the issuance results, and in particular the capital budgeting response. The model in Section 2 links equity and debt issuance to demand shifts due to demographics through investment. We document this link using expenditures on investment and research and development (R&D).

The measure of investment for public companies in year t and industry k is the share of companies with capital expenditures in year t (scaled by property, plant, and equipment in year $t-1$) greater than 0.8.[18]Columns 1-3 of Table 7 display the results of the estimation of specification (6) for the measure of investment. Demand shifts in the near future due to demographics are associated with higher investment. The estimate is significantly different from zero in the specifications in Columns 1 and 2 and marginally significant in Column 3. The effect of these demand shifts is economically large. In the specification of Column 2, a one percent annualized increase in demand from year 0 to 5 increases the share of companies conducting substantial investment by 3.2 percentage points (compared to the average share of 6.8 percentage points). A one standard deviation increase in the annualized demand growth due to demographics 0 to 5 years ahead (0.59 percentage points), increases this measure of investment by about 1.9 percentage points (more than 25% of the average industry share). [Delete: (The mean share of companies investing is 6.8 percent)] There is no significant effect instead of demand shifts 5 to 10 years ahead. If investment opportunities are the only motivation for equity issuance, there is no reason for the issuance/repurchase decision to be linked to demand shifts in the distant future.

Next, we consider as an alternative measure of broadly defined investment, Research and

[18]The cutoff for investment of 0.8 and the cutoff for R&D of 0.1 correspond approximately to the 90th percentile of the respective distributions.

Development (Columns 4-6). The measure of R&D is the share of companies with R&D expenditures in year t (scaled by assets in year $t-1$) larger than 0.1. While the evidence is somewhat mixed, demand shifts in the near future are associated with higher R&D. There is no evidence of a relation between R&D and demand shifts in the more distant future.

To summarize, we find evidence that positive demand shifts up to 5 years ahead increase both investment and R&D. Altogether, these results suggest that investment and R&D are likely to be drivers of the capital budgeting response.

5 Alternative explanations

We analyze several alternatives that could potentially explain these results.

Signalling. Consider a variant of the dividend-signalling model of Miller and Rock (1985) where equity issuance replaces the dividend as the signal and long-term demographic patterns are characterized as (quasi-)private information observed only by managers. If managers are unable to credibly signal to investors, then the firm's equity is mispriced with respect to this information. Investors are rational and understand that they are not fully informed. The manager of an undervalued firm will attempt to convey this information to the public through a costly signal, in this case a net decrease in equity issuance. The signal is costly because less issuance leads to under-investment.

In principle, this signalling equilibrium could rationalize the observed response to long-term demand shifts due to demographics. First, such a signalling equilibrium eliminates firm misvaluation at the cost of an investment distortion. However, there is no evidence that firms with high demand in the distant future invest less than firms with low demand in the distant future (Table 7). Second, disseminating this information directly to investors is a less costly strategy. The manager of the undervalued firm could disclose verifiable cohort size data and age profiles of consumption to the investors. Third, it is not clear that the single-crossing condition necessary for a separating equilibrium would be satisfied. The undervalued firm (which foregoes the equity issuance) does not suffer less from the investment distortion. Indeed, these firms have high demand due to demographics in the long-term and hence plausibly face a greater (marginal) cost of under-investment. Finally, the signalling model would not easily explain the decision to remain private by an undervalued private firm because there is no benefit from price correction for private firms.

Agency problems. Firms that intend to expand capacity may delay equity issuance until the time when funds are needed to avoid the agency problems associated with excess cash. This motivation to delay issuance could link investment opportunities in the distant future to equity issuance. However, as the subsequent analysis indicates, agency problems do not provide a plausible explanation for the findings. Consider two firms with identical short-term investment opportunities and agency problems that make it extremely costly to raise funds many years in advance of an investment opportunity. The first firm also has a favorable investment opportunity in the distant future while the second other firm does not. If the only motivation for equity issuance is to finance expansion, then both firms raise the same amount of equity in the first period to finance the short-term investment opportunity, regardless of the long-term opportunity. In the next period, the firm with the favorable long-term opportunity in the previous period (transformed into a short-term opportunity by the passage of time) issues more equity while the other firm does not issue equity. This example indicates that equity issuance is related to short-term investment opportunities but unrelated to long-term opportunities. Whether opportunities are favorable or unfavorable in the distant future, both firms delay making a decision until just before the funds might be needed for investment in each period Hence, agency problems alone do not generate a relation between long-term investment opportunities and equity issuance.

Large fixed costs of equity adjustments. A large fixed cost of equity issuance has the potential to generate an intertemporal linkage between issuance and investment opportunities in the distant future. However, this linkage would be of the opposite sign compared to the findings. We revisit the setting in which two firms have identical investment opportunities in the near future and different investment opportunities in the distant future. Assume that both firms have favorable investment opportunities in the near future. If the fixed cost of issuance is sufficiently large, then the firm with favorable investment opportunities in the near future and the distant future, might prefer to raise sufficient funds for both projects all at once rather than issuing equity each period. Essentially, incurring the fixed cost twice is worse than incurring the fixed cost once and enduring any agency problems generated by plentiful cash for the next several years. In this case equity issuance is positively (not negatively) related to investment opportunities in the distant future. If both firms have unfavorable investment opportunities in the near future, then neither firm issues equity in the first period and the first firm issues equity in the second period just in time to finance investment. Neither situation leads to the negative relation between equity issuance and investment opportunities in the distant future.

Globalization. Demographic patterns in the United States do not fully capture demand shifts induced by demographics because the goods and services produced by these industries are not exclusively consumed by United States residents. To first a approximation, this complication creates an additional measurement error problem and biases the results against the stated findings. Indeed, there are many factors that may predict demand shifts but are not related to demographics at all. The severity of this problem is mitigated by two factors: 1) age-specific growth rates in the United States are positively correlated with the analogous growth rates for other OECD countries, and 2) the trade sector is still a relatively small fraction of US GDP. In terms of explaining the findings, any aggregate patterns linking globalization to equity issuance would be captured by the control for market-wide issuance in any case. It is possible that industry-specific globalization patterns could be an omitted variable, but such changes in demand would have to be strongly negatively related to demographic patterns in the distant future.

Unobserved time patterns. The results could be driven by (unobserved) time patterns that are correlated with demographic shifts. These time patterns may confound the estimation to the extent that they are correlated with, for example, unobserved investment opportunities. While we cannot reject this possibility, the findings in this paper still hold after controlling for market-wide issuance patterns and, in most specifications, year fixed effects. An omitted variable could explain the results only if it has a differential impact across industries over time.

6 Conclusion

Are equity and debt financing decisions explained by capital budgeting, by market timing, or by both? In this paper, we attempt to answer this question by using distinct and exogenous proxies for investment opportunities and equity mispricing.

We construct predictable short-term and long-term demand shifts across industries generated by size changes in different cohorts and by the age profile of demand. We use short-term shifts in demand due to demographics to examine capital budgeting. Positive short-term demand shifts should increase the demand for capital and lead to more equity and debt issuance.

We use long-term shifts in demand due to demographics to analyze market timing. We assume that the information about profitability in the distant future predicted by demographics is not fully incorporated into asset prices; hence, long-term demand shifts proxy for mispricing. Corporate managers, to the extent that they have longer horizons than investors, should respond to this mispricing by modifying their equity issuance decisions. Companies in industries with positive demand shifts 5 to 10 years ahead will tend to be undervalued and managers should reduce equity issuance (or repurchase equity). Conversely, companies in industries with negative demand shifts 5 to 10 years ahead will tend to be overvalued, and managers should issue additional equity.

Our empirical analysis suggests that both market timing and capital budgeting play substantial roles in the decision to issue new or seasoned equity. We find that demand shifts due to demographics in the short-term are positively related with the occurrence of IPOs in an industry and with additional equity issuance by public firms. Demand shifts due to demographics in the long-term are significantly negatively related to the share of IPOs and to the net issuance of firms. Finally, there is considerable evidence that investment and R&D expenditures are related to short-term demand shifts as predicted by capital budgeting. While our estimates do not allow us to establish whether one channel is more important than the other, we find evidence that both channels have economically large impacts.

A Appendix

Proof of Proposition 1. We prove Proposition 1 (iv) for the case of time-to-build ($g(I) = 0$). The rest of the proposition is proved in the text. In this case, $I_2^* = 0$, so we only show $I_{1,\overline{\alpha}}^* > I_{1,\underline{\alpha}}^*$. If $\alpha = \underline{\alpha}$ there are no financing constraints, and hence, $I_{1,\underline{\alpha}}^* = I_{1,\underline{\alpha}}^{FB}$. If $\alpha = \overline{\alpha}$, the first-best investment is not attainable without equity issuance and the manager wishes to repurchase shares due to mispricing. Therefore, the financing constraint will be binding. Hence, the maximization problem for $\alpha = \overline{\alpha}$ is

$$\max_{n_1, I_1} \frac{1}{N}(C + V_{\widehat{\alpha}}) + \frac{1}{N + n_1}(\alpha f(I_1) - I_1 - V_{\widehat{\alpha}}) \text{ s.t. } I_1 = C + \frac{n_1}{N}(C + V_{\widehat{\alpha}})$$

We can solve for n_1 in terms of I_1 using the constraint to rewrite the objective function as

$$\max_{I_1} \frac{1}{N}(C + V_{\widehat{\alpha}}) + \left(\frac{C + V_{\widehat{\alpha}}}{N(V_{\widehat{\alpha}} + I_1)}\right)(\alpha f(I_1) - I_1 - V_{\widehat{\alpha}}).$$

The first order condition of this objective function with respect to I_1 is equivalent to (scaled by a constant)

$$(V_{\widehat{\alpha}} + I_1^*)^{-1}\left(\alpha f'(I_1^*) - 1\right) - (V_{\widehat{\alpha}} + I_1^*)^{-2}(\alpha f(I_1^*) - I_1^* - V_{\widehat{\alpha}}) = 0.$$

Further rearranging this expression and substituting the definition of $V_{\widehat{\alpha}}$ yields

$$f'(I_1^*)\left(\widehat{\alpha} f\left(I_{1,\widehat{\alpha}}\right) - I_{1,\widehat{\alpha}} + I_1^*\right) - f(I_1^*) = 0. \tag{8}$$

Notice that α disappears from the first order condition. Hence, the optimal level of investment will be independent of the level of $\overline{\alpha}$ given a particular constant $\hat{\alpha}$. This property of optimal investment arises because any increase in $\overline{\alpha}$ simultaneously increases the marginal productivity of investment (leading to share issuance) and the marginal motivation to exploit mispricing (leading to share repurchases). These two forces perfectly offset each other so that the net issuance policy and the investment policy remain unchanged in response to an increase in $\overline{\alpha}$.

We show that for any level of I_1 lower than $I_{1,\underline{\alpha}}^{FB}$ the left hand side of expression (8) is positive for $\alpha = \overline{\alpha}$. Therefore, the objective function must be a monotonically increasing function of investment at least until the investment reaches $I_{1,\underline{\alpha}}^{FB}$. The corollary of such a statement is that investment must be greater for high demand than for low demand, $I_{1,\overline{\alpha}}^* > I_{1,\underline{\alpha}}^* = I_{1,\underline{\alpha}}^{FB}$. First, we note that for any level of $I_1 \leq I_{1,\underline{\alpha}}^{FB}$ there exists an $\alpha_{I_1} \leq \underline{\alpha}$ such that I_1 is the first-best level of investment for that level of demand α_{I_1}, that is, $I_1 = I_{1,\alpha_{I_1}}^{FB}$. Next, since the expression $\alpha f(I_{1,\alpha}) - I_{1,\alpha}$ is increasing in α, we know that $\widehat{\alpha} f\left(I_{1,\widehat{\alpha}}\right) - I_{1,\widehat{\alpha}} > \alpha_{I_1} f\left(I_{1,\alpha_{I_1}}\right) - I_1$ because $\widehat{\alpha} > \underline{\alpha} \geq \alpha_{I_1}$. Hence, we obtain the following relation

$$f'(I_1)\left(\widehat{\alpha} f\left(I_{1,\widehat{\alpha}}\right) - I_{1,\widehat{\alpha}} + I_1\right) - f(I_1) > f(I_1)\left(f'(I_1)\alpha_{I_1} - 1\right) = 0.$$

This inequality demonstrates that the left hand side of the first order condition is always greater than zero for any $I_1 \leq I_{1,\underline{\alpha}}^{FB}$, and therefore, $I_{1,\overline{\alpha}}^* > I_{1,\underline{\alpha}}^*$.

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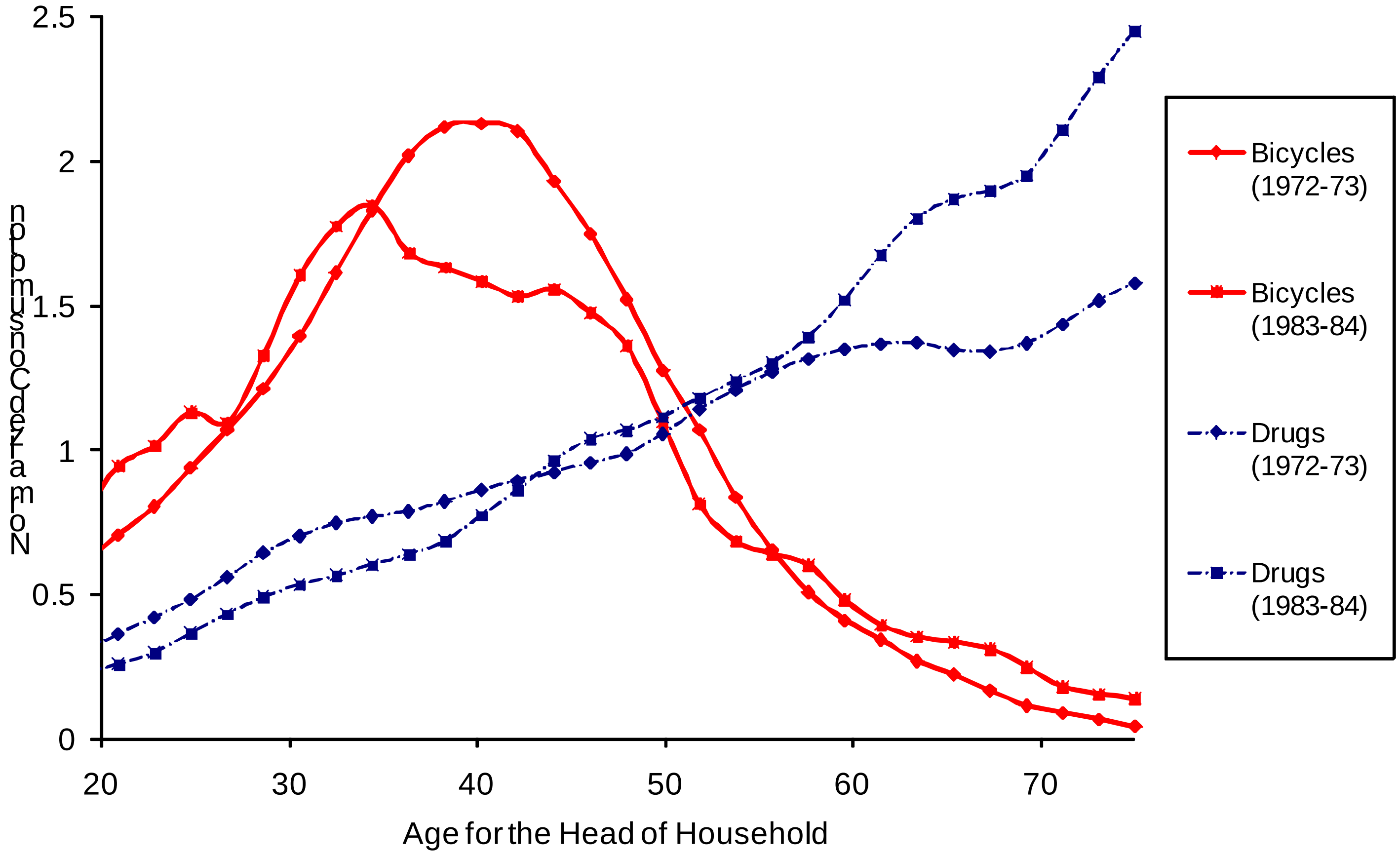
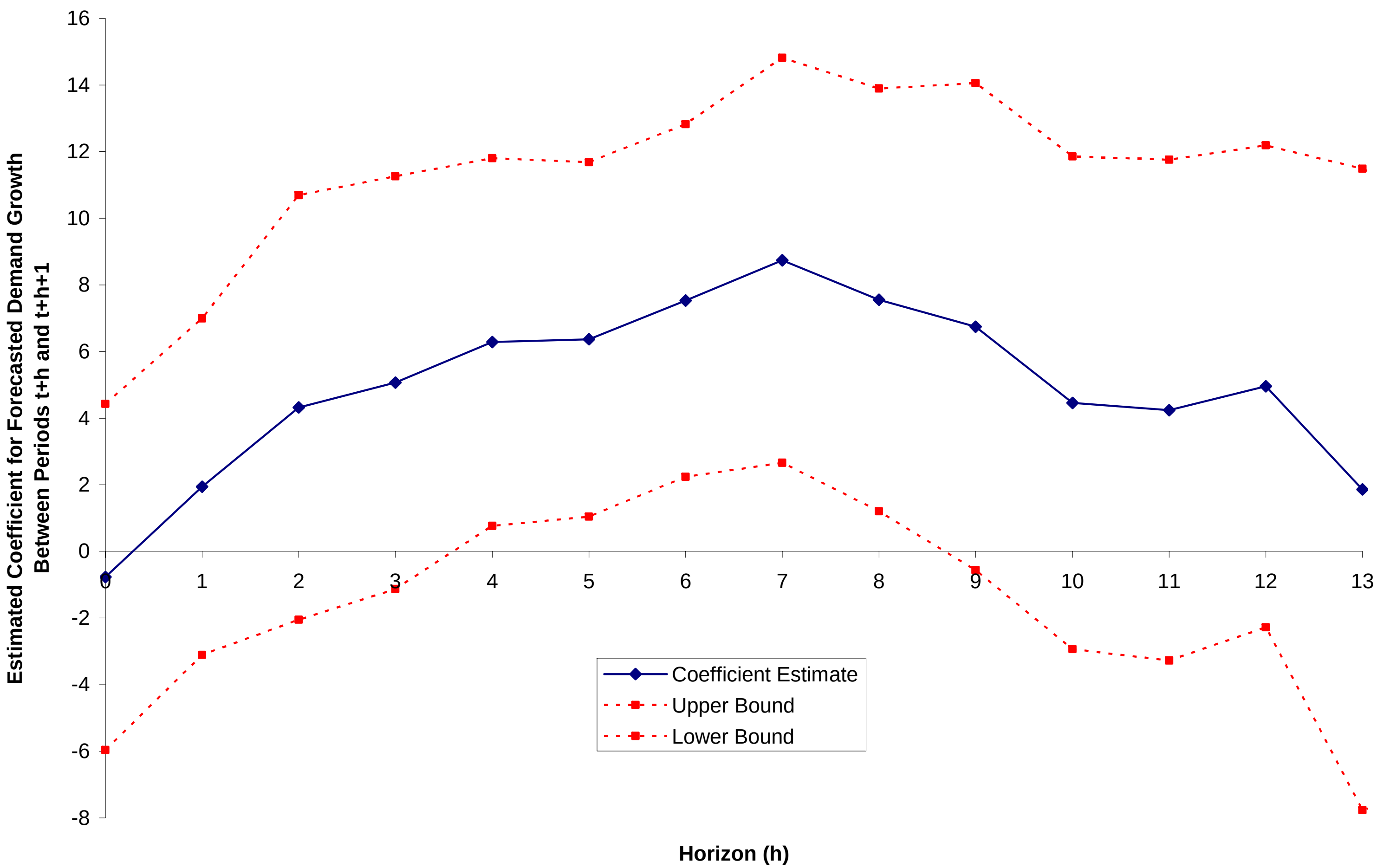
Figure 1. Age Profile for the Consumption of Bicycles and Drugs



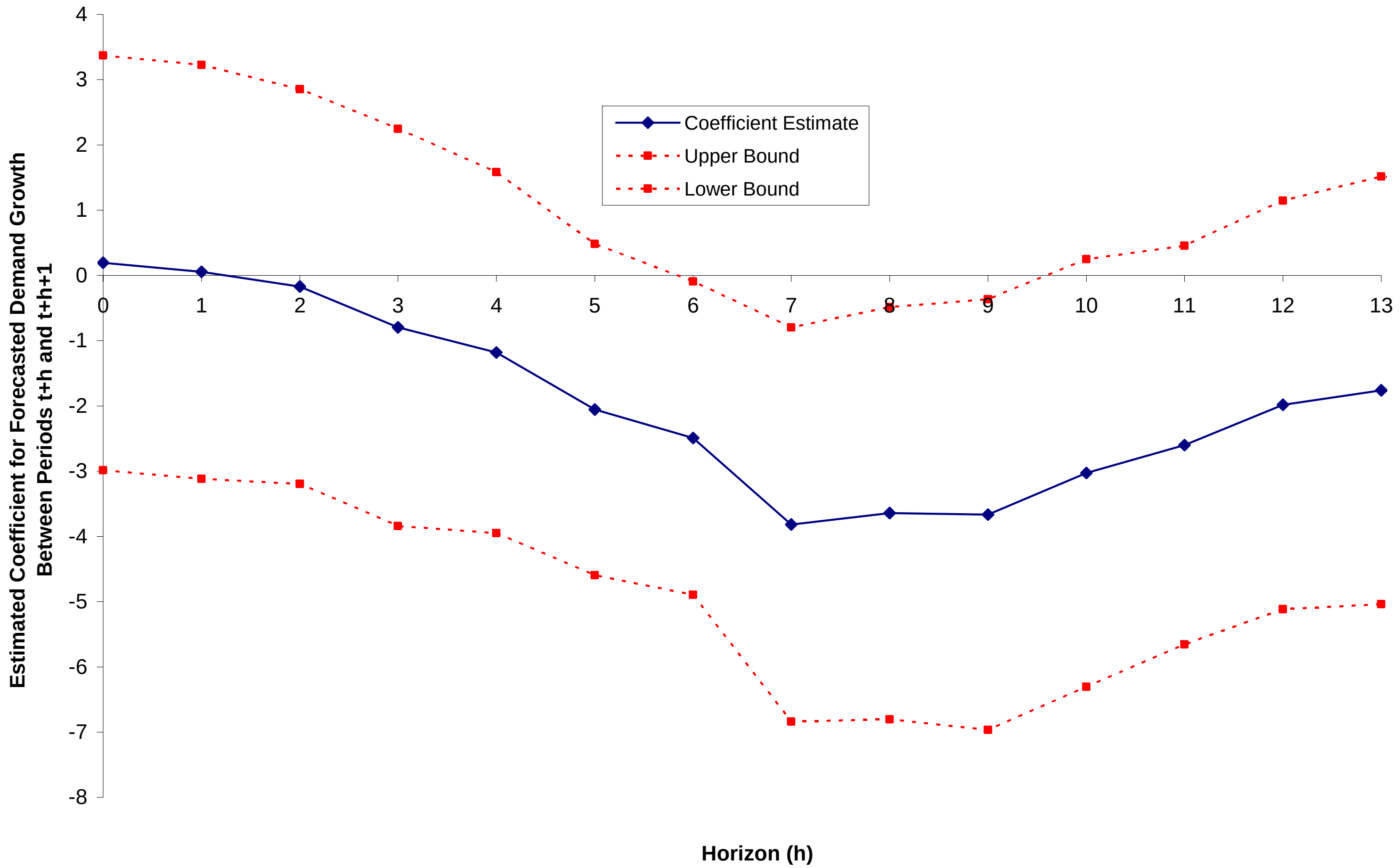
Notes: Figure 1 displays a kernel regression of normalized household consumption for each good as a function of the age for the head of the household. The regression uses an Epanechnikov kernel and a bandwidth of 5 years. Each different line for a specific good uses an age-consumption profile from a different consumption survey. Expenditures are normalized so that the average consumption for all ages is equal to 1 for each survey-good pair.

Figure 2: Return Predictability Coefficient for Demand Growth Forecasts at Different Horizons



Notes: The estimated coefficient for each horizon is from a univariate OLS regression of abnormal returns at t+1 on forecasted consumption growth between t+h and t+h+1 for the subsample of Demographic Industries during the period 1974-2004. The confidence intervals are constructed using standard errors clustered by year and then scaled by a function of the autocorrelation coefficient estimated from the sample orthogonality conditions.

Figure 3: Combined Equity Issuance Predictability Coefficient Using Growth at Different Horizons



Notes: The estimated coefficient for each horizon is from a univariate OLS regression of the share of companies in an industry that issued equity either through a new listing in CRSP or through a seasoned issuance for year t+1 on forecasted consumption growth between t+h and t+h+1 for the subsample of Demographic Industries during the period 1974-2004. Each regression includes controls for market-wide patterns in new listings, industry-level book-to-market, and industry fixed effects.

Table 1. Summary Statistics: Predicted Demand Growth Rates Due to Demographics

Expenditure Category	No. Years	Forecasted 0-5 Growth	Demogr. Industry	Forecasted 0-5 Growth	Demogr. Industry	% Dem. Industry
		1975		2000		
	(1)	(2)	(3)	(4)	(5)	(6)
Child Care	30	0.0001	Yes	0.0024	Yes	100%
Children's Books	28	.	.	0.0077	Yes	93%
Children's Clothing	30	0.0226	Yes	0.0138	Yes	100%
Toys	30	0.0044	Yes	0.0084	No	77%
Books -- college text books	30	0.0270	Yes	0.0156	Yes	100%
Books -- general	30	0.0205	Yes	0.0103	No	84%
Books -- K-12 school books	30	-0.0087	Yes	0.0092	Yes	100%
Movies	30	0.0232	Yes	0.0118	No	26%
Newspapers	30	0.0174	No	0.0140	No	0%
Magazines	30	0.0206	Yes	0.0122	No	29%
Cruises	28	.	.	0.0143	No	28%
Dental Equipment	30	0.0138	No	0.0133	No	35%
Drugs	30	0.0167	No	0.0153	Yes	10%
Health Care (Services)**	30	0.0173	No	0.0135	No	0%
Health Insurance	30	0.0168	No	0.0142	Yes	16%
Medical Equipment**	30	0.0173	No	0.0135	No	0%
Funeral Homes and Cemet.	28	.	No	0.0166	Yes	59%
Nursing Home Care	30	0.0198	Yes	0.0113	Yes	87%
Construction Equipment*	30	0.0200	Yes	0.0121	Yes	100%
Floors	30	0.0177	No	0.0140	Yes	81%
Furniture	30	0.0201	Yes	0.0105	No	58%
Home Appliances Big	30	0.0169	No	0.0117	No	0%
Home Appliances Small	30	0.0153	No	0.0132	No	0%
Housewares	30	0.0192	Yes	0.0138	Yes	58%
Linens	30	0.0170	No	0.0130	No	52%
Residential Construction*	30	0.0200	Yes	0.0121	Yes	100%
Residential Development*	30	0.0168	No	0.0130	No	13%
Residential Mortgage	30	0.0164	Yes	0.0070	No	77%
Beer (and Wine)	30	0.0209	No	0.0110	No	48%
Cigarettes	30	0.0178	No	0.0133	No	10%
Cigars and Other Tobacco	30	0.0141	No	0.0159	No	6%
Food	30	0.0145	No	0.0127	No	0%
Liquor	28	.	No	0.0144	No	14%
Clothing (Adults)	30	0.0197	Yes	0.0130	Yes	29%
Cosmetics	30	0.0222	Yes	0.0149	No	6%
Golf	30	0.0217	Yes	0.0146	Yes	68%
Jewelry	30	0.0189	Yes	0.0134	Yes	68%
Sporting Equipment	30	0.0183	No	0.0096	No	42%
Life Insurance	30	0.0140	No	0.0150	Yes	48%
Property Insurance	30	0.0177	No	0.0133	No	10%
Airplanes	28	.	.	0.0139	Yes	14%
Automobiles	30	0.0199	Yes	0.0112	No	26%
Bicycles	30	0.0027	Yes	0.0040	Yes	71%
Motorcycles	28	.	.	0.0115	Yes	76%
Coal	30	0.0149	No	0.0135	No	0%
Oil	30	0.0161	No	0.0129	No	0%
Telephone	30	0.0185	No	0.0129	No	0%
Utilities	30	0.0149	No	0.0136	No	0%
Mean 0-5 Cons. Growth		0.0165		0.0123		
Std. Dev. 0-5 Cons. Growth		0.0064		0.0028		

Notes: Complete list of expenditure categories, with number of years of availability of data (Column 1) and average predicted five-year demand growth rate due to demographic changes in 1975 (Column 2), and in 2000 (Column 4). The last two Rows present the Mean and Standard Deviation of the 5-year predicted consumption growth across all the goods in the relevant year. Table 3 also indicates whether the industry belongs to the subsample of *Demographic Industries* in 1975 (Column 3), and in 2000 (Column 5). Each year the subset *Demographic Industries* includes the 20 industries with the highest standard deviation of forecasted annual consumption growth over the next 15 years. Column 6 presents percentage of the years 1974-2004 in which the expenditure category belongs to the subsample of "Demographic Industries".

Table 2. Predictability of New Equity Listings Using Demographics

Dependent variable	Share of Firms That Are New Equity Listings							
Industry Sample	Demographic						Non-Demographic	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Forecasted annualized demand growth between *t* and *t+5*	3.349	2.237	2.446	2.785	1.994	2.831	1.687	-0.525
	(1.847)*	(1.474)	(1.270)*	(1.304)**	(1.877)	(2.273)	(2.866)	(4.502)
Forecasted annualized demand growth between *t+5* and *t+10*	-4.843	-2.486	-3.071	-3.153	-4.793	-3.572	-4.955	-6.930
	(1.453)***	(1.384)*	(1.403)**	(1.360)**	(1.949)**	(1.913)*	(3.289)	(4.270)
Industry market to book ratio		0.000	0.003	0.004	0.006	0.002	0.004	0.011
		(0.0065)	(0.007)	(0.010)	(0.009)	(0.012)	(0.009)	(0.009)
Aggregate share of new listings		0.890	0.841		1.229		0.716	
		(0.143)***	(0.151)***		(0.1507)***		(0.072)***	
Industry fixed effects			X	X	X	X	X	X
Year fixed effects				X		X		X
Jay Ritter's IPO sample					X	X		
R^2	0.040	0.133	0.245	0.306	0.260	0.315	0.264	0.297
N	*N* = 580	*N* = 580	*N* = 580	*N* = 580	*N* = 451	*N* = 451	*N* = 848	*N* = 848

Notes: Columns 1 through 4 report the coefficients of OLS regressions of the share of firms in an industry that are new listings in CRSP for year t+1 on the forecasted annualized demand growth due to demographics between t and t+5 and between t+5 and t+10 for the subset of Demographic Industries. Columns 5 and 6 report regression results for the subset of Demographic Industries where the dependent variable is defined using new listings recorded in Jay Ritter's IPO sample (from 1980 until 2003). Columns 7 and 8 report the regression coefficients for the subset of Non-Demographic Industries. The forecasts are made using information available as of year t-1. The coefficients on the forecasted annual demand growth are normalized by the number of years of the forecast (5 for both coefficients). Each year the subset of Demographic Industries includes the 20 industries with the highest standard deviation of forecasted annual consumption growth over the next 15 years. Standard errors are clustered by year and then scaled by a function of the autocorrelation coefficient estimated from the sample orthogonality conditions. A thorough description of the standard errors is available in the text.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3. Predictability of Net Equity Issuance and Net Equity Repurchases Using Demographics

Dependent variable	Large Net Equity Issues			Large Net Equity Repurchases			Net Equity Issuance	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Forecasted annualized demand growth between *t* and *t+5*	4.046 (2.539)	4.564 (1.955)**	2.304 (1.637)	-4.209 (1.839)**	-1.688 (1.357)	-0.939 (1.619)	-2.529 (0.9970)**	-1.782 (0.821)**
Forecasted annualized demand growth between *t+5* and *t+10*	-7.241 (2.588)***	-5.267 (2.170)**	-4.294 (2.013)**	3.080 (1.760)*	3.699 (1.859)**	3.222 (2.070)	2.852 (1.034)***	1.533 (1.048)
Industry market to book ratio		0.016 (0.021)	0.037 (0.023)		0.056 (0.016)***	0.046 (0.019)**	-0.010 (0.007)	-0.012 (0.009)
Aggregate share of large net equity issues		0.892 (0.125)***						
Aggregate share of large net equity repurchases					1.047 (0.353)***			
Aggregate net equity issuance							2.557 (0.677)***	
Industry fixed effects		X	X		X	X	X	X
Year fixed effects			X			X		X
R^2	0.030	0.284	0.349	0.013	0.169	0.213	0.230	0.286
N	*N* = 575	*N* = 575	*N* = 575	*N* = 575	*N* = 575	*N* = 575	*N* = 575	*N* = 575

Notes: Columns 1 through 3 report the coefficients of OLS regressions of the share of firms in an industry with stock issues minus stock repurchases divided by the lagged book value of assets that is greater than 3% for year t+1 on the forecasted annualized demand growth due to demographics between t and t+5 and between t+5 and t+10. Columns 4 through 6 report regression coefficients of the share of firms in an industry with stock repurchases minus stock issues divided by the lagged book value of assets that is greater than 3% for year t+1 on the forecasted annualized demand growth. Columns 7 and 8 report regression coefficients of industry stock issues net of stock repurchases scaled by industry book value of assets (a continuous measure) for year t+1 on the forecasted annualized demand growth. The demand forecasts are made using information available as of year t-1. The coefficients on the forecasted annual demand growth are normalized by the number of years of the forecast (5 for both coefficients).
All specifications only include observations from the subset of Demographic Industries which are the 20 industries with the highest standard deviation of forecasted annual consumption growth over the next 15 years. Standard errors are clustered by year and then scaled by a function of the autocorrelation coefficient estimated from the sample orthogonality conditions. A thorough description of the standard errors is available in the text.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4. Predictability of Combined Equity Issuance Using Demographics

Dependent variable	Share of Firms That Are New Listings or Conducted a Large Net Equity Issuance							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Forecasted annualized demand growth between *t* and *t+5*	3.717 (2.250)*	3.509 (1.506)**	2.564 (1.247)**	3.717 (1.741)**	3.509 (1.691)**	2.564 (1.802)	3.194 (1.363)**	2.436 (1.168)**
Forecasted annualized demand growth between *t+5* and *t+10*	-6.103 (2.052)***	-3.907 (1.571)**	-3.749 (1.517)**	-6.103 (1.863)***	-3.907 (1.476)**	-3.749 (1.345)***	-3.674 (1.477)**	-3.519 (1.412)**
Industry market to book ratio		0.009 (0.011)	0.021 (0.012)*		0.009 (0.011)	0.021 (0.014)*	0.006 (0.011)	0.014 (0.012)
Industry investment							-0.032 (0.034)	-0.023 (0.032)
Industry accounting return on equity							0.117 (0.047)**	0.141 (0.050)***
Aggregate combined equity issues		0.947 (0.134)***			0.947 (0.148)***		0.974 (0.135)***	
Industry fixed effects		X	X		X	X	X	X
Year fixed effects			X			X		X
Double Clustering				X	X	X		
R^2	0.046	0.349	0.413	0.046	0.349	0.413	0.359	0.426
N	*N* = 572	*N* = 572	*N* = 572	*N* = 572	*N* = 572	*N* = 572	*N* = 572	*N* = 572

Notes: Columns 1 through 8 report the coefficients of OLS regressions of the share of companies in an industry that issued equity either through a new listing in CRSP or through a seasoned issuance for year t+1 on the forecasted annualized demand growth due to demographics between t and t+5 and between t+5 and t+10. The forecasts are made using information available as of year t-1. The coefficients on the forecasted annual demand growth are normalized by the number of years of the forecast (5 for both coefficients). All specifications only include observations from the subset of Demographic Industries which are the 20 industries with the highest standard deviation of forecasted annual consumption growth over the next 15 years. Standard errors are clustered by year and then scaled by a function of the autocorrelation coefficient estimated from the sample orthogonality conditions. A thorough description of the standard errors is available in the text. In columns 4-6 we use an alternative methodology to calculate standard errors based on the double-clustering approach recommended by Thompson (2006).

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5. The Impact of Industry Concentration and Time-To-Build on Combined Equity Issuance

Dependent variable	**Share of Firms That Are New Listings or Conducted a Large Net Equity Issuance**							
Sample	**High Time-To-Build**		**Low Time-To-Build**		**High Concentration**		**Low Concentration**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Forecasted annualized demand growth between *t* and *t+5*	1.101	1.617	5.225	2.078	5.478	6.746	1.057	0.866
	(1.855)	(1.725)	(3.239)	(3.477)	(2.262)**	(3.425)**	(2.337)	(1.980)
Forecasted annualized demand growth between *t+5* and *t+10*	-1.600	-2.951	-6.640	-6.283	-7.358	-8.934	-1.551	-2.302
	(2.413)	(2.762)	(2.874)**	(2.469)***	(3.745)**	(4.017)**	(2.917)	(2.790)
Industry market to book ratio	0.018	0.020	0.022	0.033	0.000	0.000	0.029	0.038
	(0.008)**	(0.012)	(0.013)*	(0.013)***	(0.008)	(0.009)	(0.008)***	(0.007)***
Aggregate net equity issues	0.897		0.751		0.754		0.958	
	(0.102)***		(0.136)***		(0.115)***		(0.132)***	
Industry fixed effects	X	X	X	X	X	X	X	X
Year fixed effects		X		X		X		X
R^2	0.428	0.471	0.313	0.357	0.279	0.317	0.420	0.499
N	*N* = 661	*N* = 661	*N* = 746	*N* = 746	*N* = 447	*N* = 447	*N* = 451	*N* = 451

Notes: Columns 1 through 8 report the coefficients of OLS regressions of the industry share of companies that issued equity either through a new listing in CRSP or through a large equity issuance for year t+1 on the forecasted annualized demand growth due to demographics between t and t+5 and between t+5 and t+10. The forecasts are made using information available as of year t-1. The coefficients on the forecasted annual demand growth are normalized by the number of years of the forecast (5 for both coefficients). The sample in Columns 1 through 4 is split using a measure of industry time-to-build (work in progress divided by the book value of assets, industries where this share is higher than 0.005 are categorized as high time-to-build industries.) The sample in Columns 5 through 8 is split using a measure of industry concentration (C-4 in 1972). The analysis of each split sample is not limited to the subset of Demographic Industries. Standard errors are clustered by year and then scaled by a function of the autocorrelation coefficient estimated from the sample orthogonality conditions. A thorough description of the standard errors is available in the text.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6. Predictability of Net Debt Issuance and Net Debt Repurchases Using Demographic Changes

Dependent variable	Large Net Debt Issues			Large Net Debt Repurchases			Net Debt Issuance	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Forecasted annualized demand growth between *t* and *t+5*	3.515 (5.240)	3.665 (4.397)	2.510 (4.630)	-1.537 (2.425)	-1.281 (1.807)	1.601 (1.576)	1.408 (0.795)*	0.569 (0.723)
Forecasted annualized demand growth between *t+5* and *t+10*	0.712 (4.388)	2.060 (3.941)	2.004 (4.213)	-2.709 (1.860)	-4.026 (1.464)***	-3.416 (1.483)**	0.886 (0.793)	0.825 (0.785)
Industry market to book ratio		0.101 (0.030)***	0.116 (0.036)***		-0.028 (0.018)*	-0.056 (0.020)***	0.011 (0.005)**	0.018 (0.006)***
Aggregate share of large net debt issues		1.319 (0.433)***						
Aggregate share of large net debt repurchases					0.509 (0.261)*			
Aggregate net debt issuance							0.168 (0.641)	
Industry fixed effects		X	X		X	X	X	X
Year fixed effects			X			X		X
R^2	0.012	0.315	0.338	0.016	0.144	0.202	0.187	0.224
N	*N* = 575	*N* = 575	*N* = 575	*N* = 575	*N* = 575	*N* = 575	*N* = 575	*N* = 575

Notes: Columns 1 through 3 report the coefficients of OLS regressions of the share of firms in an industry with debt issues minus debt repurchases divided by the lagged book value of assets that is greater than 3% for year t+1 on the forecasted annualized demand growth due to demographics between t and t+5 and between t+5 and t+10. Columns 4 through 6 report regression coefficients of the share of firms in an industry with debt repurchases minus debt issues divided by the lagged book value of assets that is greater than 3% for year t+1 on the forecasted annualized demand growth. Columns 7 and 8 report regression coefficients of industry debt issues net of debt repurchases scaled by industry book value of assets (a continuous measure) for year t+1 on the forecasted annualized demand growth. The demand forecasts are made using information available as of year t-1. The coefficients on the forecasted annual demand growth are normalized by the number of years of the forecast (5 for both coefficients).
All specifications only include observations from the subset of Demographic Industries which are the 20 industries with the highest standard deviation of forecasted annual consumption growth over the next 15 years. Standard errors are clustered by year and then scaled by a function of the autocorrelation coefficient estimated from the sample orthogonality conditions. A thorough description of the standard errors is available in the text.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 7. Predictability of Investment and R&D Using Demographic Changes

Dependent variable	Share of Firms With Large Investment			Share of Firms With Large R&D		
	(1)	(2)	(3)	(4)	(5)	(6)
Forecasted annualized demand growth between *t* and *t+5*	2.746 (1.285)**	2.990 (1.383)**	2.113 (1.287)*	0.833 (3.453)	3.849 (1.891)**	3.728 (2.147)*
Forecasted annualized demand growth between *t+5* and *t+10*	-0.530 (1.325)	-0.174 (1.685)	0.727 (1.709)	0.381 (2.667)	-0.721 (1.348)	0.161 (1.616)
Industry market to book ratio	0.008 (0.010)	0.004 (0.014)	0.012 (0.015)	0.025 (0.031)	-0.005 (0.006)	-0.004 (0.007)
Aggregate investment	0.934 (0.305)***	0.870 (0.289)***				
Aggregate R&D				0.089 (0.237)	0.310 (0.136)**	
Industry fixed effects		X	X		X	X
Year fixed effects			X			X
R^2	0.066	0.231	0.282	0.055	0.506	0.537
N	*N* = 582	*N* = 582	*N* = 582	*N* = 582	*N* = 582	*N* = 582

Notes: Columns 1 through 3 report the coefficients of OLS regressions of the industry share of companies undertaking significant investments (capital expenditures scaled by lagged property, plant and equipment) for year t+1 on the forecasted annualized demand growth due to demographics between t and t+5 and between t+5 and t+10. Columns 4 through 6 report similar regressions for the industry share of companies doing significant R&D spending (research and development scaled by lagged assets). The forecasts are made using information available as of year t-1. The coefficients on the forecasted annual demand growth are normalized by the number of years of the forecast (5 for both coefficients).

All specifications only include observations from the subset of Demographic Industries which are the 20 industries with the highest standard deviation of forecasted annual consumption growth over the next 15 years. Standard errors are clustered by year and then scaled by a function of the autocorrelation coefficient estimated from the sample orthogonality conditions. A thorough description of the standard errors is available in the text.

* significant at 10%; ** significant at 5%; *** significant at 1%