The Allocation of Socially Responsible Capital

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Abstract

Portfolio allocation decisions increasingly incorporate social values. We develop a tractable framework to study how competition between investors to own socially valuable assets affects social welfare. Relative to the most common social-investing strategies, we identify alternative strategies that result in higher impact and higher financial returns. We identify strategies for investors to have impact when impact is difficult to measure. From the firm perspective, increasing profitability can have a greater impact than directly increasing social value. We present new empirical evidence on the social preferences of investors that demonstrates the practical relevance of our theory.

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1 Introduction

The last decade has seen an invigoration of investing in companies that rank favorably on metrics of social value, such as environmental stewardship, social responsibility, and good governance practices (collectively referred to as ESG). This shift in investment strategies has the potential to alter the allocation of capital in the economy. In fact, many argue the entire purpose of this movement is to help reallocate resources to socially beneficial uses and away from socially harmful ones. It is thus centrally important to understand whether and how this style of investing generates its intended impact. This paper develops a theoretical framework to explore how investing with social convictions results in the creation of social value.

We focus on strategies based on portfolio composition rather than engagement. The most common of such strategies in practice are constructed with attention to the financial returns and the social value of the companies included in an investor's portfolio. For example, ESG index funds attempt to track the returns of a benchmark index while maximizing some composite measure of the social good of the companies in the portfolio. Proponents of such "values-aligned" investing claim that they increase the valuation of (or equivalently decreases the cost of capital for) economic endeavors that contribute the most positively to society. This in turn shifts the set of projects that markets will finance towards those that create social value and away from those that destroy it.

We argue that the folk wisdom justifying values-aligned investing is misguided, and such investment strategies are an inefficient way to use asset allocation decisions to create social value. As the prevalence of socially-motivated investing grows, investors will invariably compete for the right to invest in, or own securities issued by, more socially valuable firms. We show this competition can limit investor impact and make it more expensive.

The basic logic is captured by the following example. Suppose there is a commercial capital market willing to supply financing for a return of 5%. There are also two *social*

investors, who care about both financial returns and social value creation. Suppose further that there are three firms, each of which needs one unit of capital to operate:

- Firm A generates a 6% profit and 10 units of social value.
- Firm B generates a 6% profit and 12 units of social value.
- Firm C generates a 4% profit and 9 units of social value.

Investors finance companies in exchange for a share of their profits. Imagine the social investors employ *values-aligned* strategies, meaning they make investment decisions based on the social value created by the company in which they are investing and the financial return they will receive. Specifically, investors allocate their capital to maximize the sum of their financial return and the social value of the firm they finance. The social investors will thus compete to finance Firms A and B. Firm B will receive capital at a lower cost than Firm A because it generates more social value. Firm A is financed by social investors at a cost of capital of 5%, the cost of the firm's outside option in the commercial capital market. Firm B is financed by social investors at a cost of capital of 3%, so that the benefits to social investors of investing in A and B are equalized. Firm C is unfinanced and thus does not generate social value.

In this example the social investors have failed to generate social impact. In their absence, the equilibrium allocation of capital would be unchanged, as Firms A and B could be commercially financed. Competition between commercial and social investors *displaced* commercial investors and thus limited social investor impact. Further, competition *between* the social investors lowered the returns to the social investor in Firm B even though this investor had no social impact.

Now imagine the investor financing Firm B were to deviate and instead finance Firm C. Facing no competition from other social or commercial investors, this investor could earn a return of 4%, an improvement over the return they received financing Firm B. And, since

investing in Firm C does not displace a commercial investor, all three firms would be funded and total social value would increase. That is, there exists a deviation from a values-aligned investing strategy that increases not only impact but also financial returns.

While this example is stark and highly stylized, we show these forces persist in a more general model, in which many commercial investors and social investors compete and in which firms' costs of capital are determined in equilibrium. To highlight the limits of typical socially motivated investment strategies in the presence of competing investors, our framework encompasses two types of social investors. *Values-aligned* social investors, as in the example and consistent with observed real-world social investing strategies, form portfolios as if they only care about their financial returns and the social value generated by the firms in which they invest. *Impact-aligned* social investors, in contrast, care about their financial returns and the consequences of their investment decisions for total social welfare.

Beyond admitting a tractable analysis of equilibrium behavior, our model yields several positive and normative implications for social investors and entrepreneurs. First, we show that in equilibrium, values-aligned social investors and entrepreneurs exhibit positive assortative matching – investors who care more about social welfare match to entrepreneurs that create more social value. More interestingly, when social investors are impact-aligned, a form of negative assortative matching emerges whereby the investors who care more about social welfare match to entrepreneurs who create less social value. This can be viewed as an extension of the core logic that impact-aligned investors do not want to displace investors with less concern for social value, whether that be commercial investors, or other social investors with a lower degree of altruism.

Second, as highlighted in the example, we identify improvements to the equilibrium investment strategies of values-aligned social investors that create more social impact *and* deliver higher financial returns. When investment opportunities with high social value are also profitable enough to attract commercial investment, values-aligned investors compete with and displace commercial investors who would have otherwise financed these activities.

Further, competition *between* social investors generates a financial concession that is wasteful from the perspective of generating impact. We show that a portion of the price impact generated by values-aligned investment results in a transfer from investors to firms' existing owners, without expanding the pool of socially valuable projects. This generates scope not only to increase the impact of values-aligned investment strategies, but also the financial return.

Third, we use our model to speak to an important issue in impact investing, the measurement of impact itself. In particular, we ask how impact-aligned strategies are affected by informational frictions that limit agents' ability to assess social investment opportunities. We extend our baseline model to incorporate incomplete information about both the profitability and social value of investment opportunities. We show that incomplete information about profits, not just about social value, limits the amount of impact that impact-aligned investors are able to achieve. It also leads impact-aligned investors to adopt strategies that look similar to those of values-aligned investors–they are willing to fund projects that appear commercially viable–a stark contrast to optimal impact-aligned investment strategies in the complete-information model.

How important are our findings in practice? This depends on the extent to which socially-minded investors adopt values-aligned strategies, and also the extent to which they do so as a way to operationalize a true preference for impact-alignment. Our results suggest this could happen for two reasons–investors are mistakenly adopting values-aligned strategies, or because informational frictions make such strategies optimal for impact-aligned investors. To explore this, we conduct a laboratory experiment to elicit investors' social preferences and to understand how investors operationalize these preferences. We find significant heterogeneity in social investing preferences, with sizable groups of participants caring only about their impact, only about values alignment, and some having no willingness to trade off financial returns for either social characteristic of investments. Further, even in our experimental environment without informational frictions, we find that some investors with impact-aligned

preferences mistakenly adopt values-aligned investment strategies. These findings together suggest that the prevalence of values-aligned investing is at least in part due to mistaken adoption of values-aligned strategies by investors who have a preference for impact creation.

Our framework also has implications for evaluating the social impact of a firm, sometimes called its *enterprise impact* (Brest et al., 2016). Enterprise impact depends not only on the amount of capital used by the enterprise, but also on the *type* of capital used by the enterprise. All else equal, enterprises that attract the capital of socially minded investors have a lower contribution to social welfare than those that attract the capital of purely commercial investors. Holding fixed the social value created by a firm, it can raise its enterprise impact by reducing its dependence on social capital, freeing social capital to fund another enterprise that is unable to obtain commercial financing. The more profitable a firm, the less likely it is to rely on scarce, socially valuable capital. Our framework thus provides a new connection between the profitability of an enterprise and its contribution to social welfare.

Literature Review

This paper contributes to the growing literature on investing with social preferences, and in particular whether these preferences can induce more socially desirable economic activity. The majority of the literature studies investors who value investment in socially responsible activities, rather than a preference for generating impact through their investment strategies. A key theme of this literature is that the high degree of substitutability of capital limits the ability of socially motivated investors to have impact. In standard equilibrium asset pricing models, the extent to which a tilt to more socially desirable investments can affect their relative cost of capital depends on the degree to which this limits aggregate risk sharing in the economy (e.g. Heinkel et al., 2001, Pastor et al., 2020, Pedersen et al., 2021, Zerbib, 2022, Berk and van Binsbergen, 2021).

Building on this work, we highlight a new mechanism through which impact of values-aligned investment strategies is limited. Consistent with the above literature, we find values-aligned investment strategies can in principal shift capital to more socially valuable activities.

However, we show that these strategies are inefficient at generating impact in terms of the return concession required because competition between social investors to hold socially responsible investments bids up prices more than necessary for an investor to achieve a given social impact.

This paper connects more closely to a smaller theoretical literature asking how social investors should behave to maximize their impact in other settings. Broccardo et al. (2020) and Edmans et al. (2022) argue that engagement and "tilting" strategies, respectively, are more effective than divestment in generating impact. Oehmke and Opp (2020) and Landier and Lovo (2023) study activist social investors who aim to induce firms to adopt green investment choices in the presence of managerial moral hazard. In contrast to these papers, we study passive investors in a complete information environment, whose goal is to enable new projects by offering cheaper capital to firms with socially valuable projects. In their setting, Oehmke and Opp (2020) show that values-aligned social investors cannot generate social impact because they would rather not invest at all than invest in an improved but still polluting company. Our results, in contrast, stem from the role of competition between investors for socially valuable investments, which is not modeled in their paper.[1]

Our empirical evidence contributes to the literature estimating the social preferences of investors. Heeb et al. (2021) finds investors have a preference for impact, but that willingness to pay for impact does not scale with its magnitude. Most closely related to our empirical exercise, Bonnefon et al. (2023) conducts an experiment to distinguish between preferences for values alignment-and impact-alignment, and find the representative social investor has at best a modest preference for impact. Humphrey et al. (2021) and Nofsinger et al. (2019) find investors are more attentive to negative social attributes than positive ones. We make two important contributions to this literature. First, we identify heterogeneity in the social preferences of investors–in particular that a sizable share seem to have strong preferences

[1]Other papers modeling investors with preferences for impact include Gupta et al. (2021), Moisson (2020), Chowdhry et al. (2019), and Roth (2020).

for impact-alignment. Second, we show investors may be incorrectly operationalizing their preferences in their social investing strategies.

2 Baseline Model

Players, Technology, and Contracts

There is a finite set E of entrepreneurs. Each one is endowed with a project that requires one unit of capital. If entrepreneur i receives the requisite capital, their project returns $\pi_i \in \mathbb{R}^+$ profit and $w_i \in \mathbb{R}$ "social value," where π_i and w_i represent the private and social return of the project respectively.[2] We assume that the features of each project are perfectly observable to all players.

There is a finite set S of social investors, each of whom allocates one unit of capital.[3] There is also a market for commercial capital that elastically supplies financing to all firms at required rate of return of r^C.

A contract between some investor and an entrepreneur i specifies the transfer of one unit of capital from the investor to the entrepreneur in exchange for financial return r_i on their invested capital. The entrepreneur receives a share of profits $\pi_i - r_i$, and w_i social value is created. We will sometimes refer to r_i as the price or cost of capital offered to an entrepreneur. Because we are studying a complete information environment without contracting frictions, this contract can be understood as either debt or equity. In addition to being able to finance the entrepreneurs in E, social investors can also allocate their capital to a "social value-neutral" asset with financial return r^C and 0 social value.

[2]We assume that w_i encompasses the full social return of the project, including the private return π_i, as well as any consumer and employee surplus and externalities arising from the project. However the theory would proceed unchanged were we to interpret w_i more narrowly, as representing say, climate externalities.

[3]We discuss how the analysis can be extended to a model with a continuum of investors and projects in Appendix B.4.

Preferences

We index investors and entrepreneurs such that investor i matches with entrepreneur i. Each entrepreneur's utility is their share of the profit, $\pi_i - r_i$. We will separately examine two classes of social investors.

Values-aligned social investors make investment decisions based on the financial returns they receive and the social value created by the entrepreneur they have financed. That is, they choose their investment strategy to maximize:

$$r_i + \theta_i w_i, \tag{1}$$

where $\theta_i \in \left\{\theta^1, ..., \theta^K\right\} \subset \mathbb{R}^+$ represents the strength of investor i's social preference. Without loss of generality assume $\theta^1 < ... < \theta^K$. Further, define $S_k \equiv \left\{i \in S | \theta_i = \theta^k\right\}$.

Impact-aligned social investors, in contrast, make investment decisions based on the financial returns they receive and the consequence of their investment for aggregate social value. In particular, they maximize:

$$r_i + \theta_i \sum_{j \in \bar{E}} w_j = (r_i + \theta_i w_i) + \theta_i \sum_{j \in \bar{E} \setminus i} w_j, \tag{2}$$

where $\bar{E}$ is the set of entrepreneurs who receive financing.[4] We can observe that the difference between the objective functions of values-aligned and impact-aligned social investors is that impact-aligned social investors derive utility equally from all social output regardless of who financed it. The implication of this difference is that impact-aligned investors internalize the consequences of their actions on total social welfare, while values-aligned investors only consider the social value of the firm they finance.

[4]We note that as w_i includes r_i, both preferences above "double count" r_i. The values-aligned preferences can be rewritten as $r_i + \tilde{\theta}_i (w_i - r_i)$ and the impact-aligned preferences can be rewritten as $r_i + \tilde{\theta}_i \left(w_i - r_i + \sum_{j \in \bar{E} \setminus i} w_j\right)$, where $\tilde{\theta}_i = \frac{\theta_i}{1+\theta_i}$. Hence the two preferences can be equivalently stated, up to a re-normalization, without double counting r_i.

There are two interpretations of the assumption that values-aligned investors do not fully internalize the implications of their investment decision on social welfare. Values-aligned investors may derive intrinsic utility from owning firms that create social value, similar to the conception of warm-glow altruists in Andreoni (1990). In such a case, the analysis to follow should be understood as exploring the positive implications of these two modes of investment behavior. Alternatively, values-aligned preferences may represent the *behavior* of socially conscious investors, while impact-aligned social preferences may more faithfully represent the *intentions* of socially conscious investors to affect social change. Under this interpretation, our analysis of the behavior of impact-aligned social investors offers normative guidance to real-world investors with social preferences. In Section 5 we discuss the empirical evidence, the findings of which suggest that both interpretations are relevant.

Timing of Actions

First, in the *offer stage*, social investors offer contracts to entrepreneurs.[5] Simultaneously, all firms receive an offer for commercial financing at rate r^C. Then, in the *acceptance stage,* entrepreneurs choose at most one contract to accept and payoffs are realized.

Equilibrium

The solution concept is pure-strategy Subgame Perfect Equilibrium. In the acceptance stage, all entrepreneurs choose the contract offered to them that maximizes their share of the profits. In the offer stage, all investors choose a contract that maximizes their utility among all contracts that will be accepted, given the contracts offered by other investors.

[5]For technical convenience, we allow social investors to offer more than one contract. In the event that multiple contracts are accepted, one is chosen uniformly at random to be implemented.

Social Welfare

Our measure of social welfare is $W = \sum_{i \in \bar{E}} w_i$, where $\bar{E}$ is the set of entrepreneurs that receive financing. Our interpretation is that w_i is the total social value created by firm i if it receives financing, including the value to the firm's owners.[6] Impact-aligned social investors can therefore be understood to be maximizing a modified variant of social welfare that increases the weight placed on their own consumption. Also note that, consistent with Hart and Zingales (2017) and Broccardo et al. (2020), our measure of welfare does not include the "altruistic" utility that social investors derive from the creation of social value w_i. The exclusion of investors' altruistic utility from the social welfare function can be motivated by assuming that the utility that investors derive from supporting socially valuable firms is "small" relative to the other ways in which those firms contribute to social value.

Discussion of Modeling Choices

To present our results in a parsimonious manner, our model omits several important features of financial markets that are relevant for social investing. First, our model only accommodates a limited form of endogenous firm entry. In our model the universe of potential firms is fixed. The allocation of commercial and social capital determines which of these firms ultimately enter the market, but entrepreneurs cannot respond by altering the distribution of potential firms. Second, because we have assumed that the commercial market elastically supplies capital at rate r^C, rather than assuming a finite supply of commercial capital, there is no channel for social investors to raise the cost of capital of firms with negative social value through divestment. In Section A.1 we endogenize the commercial cost of capital and demonstrate that in this variant of the model divestment has an impact, but allowing for this does not change our main results. Third, in our baseline model entrepreneurs cannot endogenously change the properties of existing firms in response to market prices. This

[6] Under this interpretation, the value accruing to the firm's owners is determined independently of how ownership is divided, i.e. the welfare weights placed on entrepreneurs and investors are the same.

constraint is relaxed in Section A.2 and once again, we show that our main results are robust to this extension.

Finally, we note that our model features a finite number of investors, each with a discrete amount of capital. This ensures that each investor is able to have a positive, measurable impact on social welfare and thus is able to operationalize their preference for impact in their portfolio strategies. While this modeling choice maps well into private capital markets with large investors, we note it is still possible for smaller investors to have impact. One way to interpret our model is to conceive of each investor as a fund, which aggregates the capital of smaller investors as in Landier and Lovo (2023). Alternatively, Section B.4 discusses how we can extend our model to a limiting case where investors are atomistic but yet impact-aligned investors' regard for social impact is preserved in the limit.

3 Analysis of Baseline Model

To understand the behavior of values-aligned and impact-aligned social investors we separately characterize the equilibrium of the model in which either all investors are values-aligned or all are impact-aligned. Beginning in Section 3.3 we present results in the model in which both types of social investors coexist.

3.1 Values-Aligned Social Investors

For any two entrepreneurs i and j who are both supported by social investors with the same subscripts, the investors' equilibrium incentive compatibility condition dictates that

$$r_i + \theta_i w_i \geq r_j + \theta_i w_j. \tag{3}$$

This incentive compatibility condition dictates that at the equilibrium prices r_i and r_j,

no social investor prefers to undercut another one.[7] This inequality implies that investors and entrepreneurs follow positive assortative matching in equilibrium.

Lemma 1. *For any two values-aligned social investors i and j (matched in equilibrium to entrepreneurs i and j), if $\theta_i \geq \theta_j$, then $w_i \geq w_j$.*

Lemma 1 is an implication of the fact that investors' preferences are supermodular in θ_i and w_i. Social investors with relatively higher altruism θ_i have relatively higher willingness to pay per unit of social value of a given enterprise. Therefore, in equilibrium the investors with highest altruism finance the enterprises with the highest social value. This will present a point of contrast to the case where investors are impact-aligned.

Our next observation, once again following from the above incentive compatibility condition, is that cost of capital is decreasing in an entrepreneur's social value w_i.

Lemma 2. *For any two entrepreneurs financed in equilibrium by values-aligned social investors, if $w_i > w_j$ then $r_i \leq r_j$. This inequality is strict when $r_i > 0$ and $r_j > 0$.*[8]

Lemma 2 will be play an important part of the analysis to follow, and an important point of contrast to the case where social investors are impact-aligned. When investors are values-aligned, the fact that they compete with one another to be the owners of socially valuable companies causes them to bid up the prices of companies with higher social value. As we will discuss further, in some cases this expands the financing frontier for socially valuable companies, while in other cases it only serves to increase the share of profits retained by entrepreneurs with socially valuable companies.

Figure 1 depicts the equilibrium matching of investors to entrepreneurs. The graph shows the space of available investment opportunities, parameterized by π and w, and the shaded regions show the sets of entrepreneurs financed by different types of investors.

[7] We adopt the convention that an entrepreneur i who accepts no offers for financing has $r_i = \pi_i$.

[8] This inequality also does not hold strictly for entrepreneurs whose social value w_i is high enough that their equilibrium cost of capital is $r_i = 0$. By assumption there is no opportunity for investors to undercut one another when the equilibrium cost of financing is 0 – we interpret these instances as akin to philanthropy.

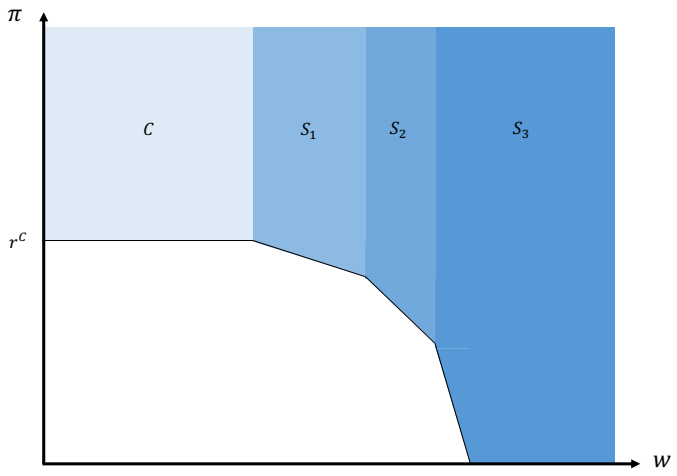

Figure 1: Equilibrium investment with values-aligned social investors

Entrepreneurs in the lightest blue region, with profits higher than the commercial hurdle rate r^C but relatively low social value, are financed by the commercial market. Entrepreneurs with progressively higher social value w_i are financed by social investors with progressively higher levels of altruism, and entrepreneurs in the unshaded region are unfinanced in equilibrium. The financing frontier becomes progressively steeper as the investors become more altruistic (with slope $-1/\theta^i$), reflecting their increased willingness to trade off financial return for social value. Appendix Section B.1 describes the precise strategies that support this equilibrium.

This model abstracts from risk-aversion and diversification motives of investors. In the presence of such motives, while values-aligned investors would still finance relatively higher social value projects *on average*, they would also finance low social value projects that improve diversification of the investor's portfolio (Pedersen et al., 2021).

3.2 Impact-Aligned Social Investors

Next we analyze the equilibrium allocation of capital when social investors are all impact-aligned. One of the principal differences to the case where social investors are values-aligned is that, so long as social capital is sufficiently scarce, impact-aligned investors do not finance commercially viable entrepreneurs regardless of their social value. We maintain the following assumption for the remainder of Section 3.2.

Assumption 1. *Social capital is scarce:* $|S| \leq \left|\left\{i \in E : \pi_i + \theta^1 w_i > r^C, \pi_i < r^C\right\}\right|$

Assumption 1 regards the number of entrepreneurs that are not commercially viable (i.e. $\pi_i < r^C$), with projects whose full profit plus the social value as judged by the social investor with lowest altruism exceeds the commercial rate of return (i.e. $\pi_i + \theta^1 w_i > r^C$). If the number of such entrepreneurs is greater than the number of social investors, (i.e. when Assumption 1 holds), then impact-aligned investors never finance entrepreneurs that could have attracted commercial capital.

Lemma 3. *In equilibrium no impact-aligned investor finances an entrepreneur with* $\pi_i \geq r^C$.

When social capital is scarce, there is always a non-commercially viable investment opportunity that an impact-aligned investor i would prefer to financing a commercially viable investment. Financing a commercially viable investment delivers returns of at most r^C, and because doing so displaces commercial capital it generates no social value. In contrast, by Assumption 1, there is always some unfinanced firm j satisfying $\pi_j + \theta_i w_j > r^C$.

Lemma 3 presents an important point of contrast between our baseline model, where firms have binary scale, and models where firms have more degrees of freedom in their production functions. In our baseline model, social investors who finance a commercially viable firm do not have impact, because the firm would be financed regardless. In contrast, in Landier and Lovo (2023) and Oehmke and Opp (2020) investors can have an impact by displacing commercial investors, because in doing so they can induce a firm to adopt a clean, rather

than dirty technology. In Appendix A.2, we consider a model where firms have continuous production functions and show that investors can have impact by investing in commercially viable firms to inducing them to change their scales of operation relative to if they were purely commercially financed.

We further note the stark result in Lemma 3 is in part arising because investors in our model have no diversification motive. In the presence of such motives, impact-aligned investors would be willing to invest in some commercially viable firms to reduce portfolio risk, even though doing so does not impact social welfare.

While Lemma 3 holds across all equilibria, the precise set of firms who receive financing from impact-aligned social investors is not fixed across all equilibria. Nevertheless, we have the following characterization of the capital allocation in the investor-optimal and welfare-optimal equilibrium, which reverses the positive assortative matching result for values-aligned investors.

Proposition 1. *Consider the investor- and welfare-optimal equilibrium. Take any two entrepreneurs i and j that receive capital from impact-aligned social investors with $\pi_i = \pi_j$: if $w_i > w_j$ then $\theta_i \leq \theta_j$.*[9]

Proposition 1 implies that when social investors are impact-aligned, they exhibit a form of negative assortative matching in equilibrium. Among firms with fixed a level of profits π, the higher is the social investor's altruism parameter θ_i, the lower is the social value w_i of the firm they support. This negative assortative matching holds despite the fact that the utility of impact-aligned social investors is supermodular in their altruism parameter θ_i and the social value w_i of the firm they support (as was the case with values-aligned social investors).

[9]All equilibria with the same investment frontier depicted in Figure 2 are investor- and welfare-optimal. Therefore, formally, there exists an investor- and welfare-optimal equilibrium such that holding the level of entrepreneur profit fixed, if $w_i > w_j$ then $\theta_i \leq \theta_j$. But there may be other equilibria with equivalent allocations that do not feature negative assortative matching.

We defer a formal proof of Proposition 1 to the appendix but provide a discussion here. In equilibrium, in order for an impact-aligned social investor i not to deviate and support a firm that could have attracted commercial investment, it must be that

$$\pi_i + \theta_i w_i \geq r^C. \tag{4}$$

This incentive compatibility condition is easier to satisfy for social investors with higher altruism parameters. Therefore in the welfare-optimal equilibrium, it is the impact-aligned social investors who care the least about social welfare that match to the most impactful entrepreneurs for a given level of profitability, as these are the entrepreneurs who are most able to entice social investors away from commercial markets. And because impact-aligned social investors derive utility from the social value created by all firms supported in equilibrium, social investors with high altruism parameters do not undercut social investors with less concern for social welfare, as they recognize that doing so would not expand social value.

The investor- and welfare-optimal equilibrium allocation is depicted in Figure 2. Appendix B.2 formally characterizes the allocation of impact-aligned social capital.

Before proceeding, we note that impact-aligned investors do not compete to fund assets by offering the best financing terms. This is because they recognize that undercutting another investor does not contribute to the creation of social welfare. This introduces the question of how exactly allocation of impact investors to investment opportunities occurs. In our model, Nash equilibrium ensures that no two investors attempt to finance the same firm. We view this as a stand-in for more realistic features of the economy that would facilitate the matching of investors to projects, for example informational and search frictions that would create dispersion in beliefs about project quality and opportunities to finance them.

Relatedly, in our baseline model, as a consequence of the fact that impact-aligned investors have no incentive to undercut one another, they extract the full profit from the firms they finance. In Section A.3, we demonstrate that our main results – Propositions 2 and 3

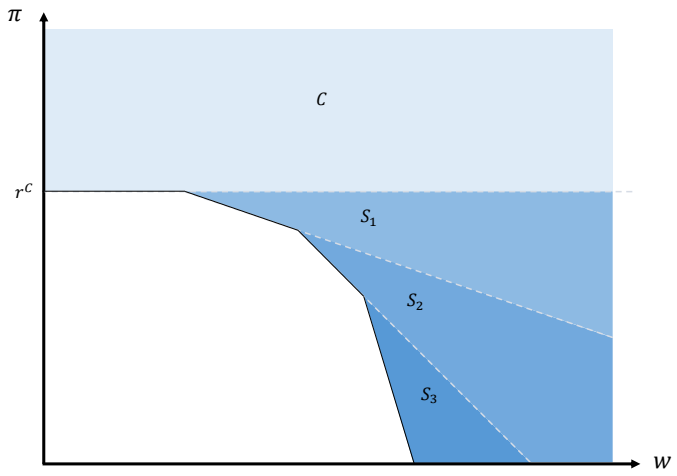

Figure 2: Equilibrium investment with impact-aligned social investors

– do not rely on the assumption that impact-aligned social investors extract the full profits of the firms they finance. Namely, we alter the model to allow entrepreneurs, rather than investors, to make take-it-or-leave-it offers and in equilibrium entrepreneurs retain positive profits.

3.3 Equilibrium Structure with Both Types of Social Investors

In the following sections we discuss a number of normative results about social investing, in a market in which both impact-aligned and values-aligned social investors coexist. Much of the above analysis continues to hold when both types of social investors are present within the same market. Lemmas 1 and 2 carry over to the case with both types of social investors. Values-aligned social investors and entrepreneurs continue to engage in positive assortative matching, and the cost of capital is decreasing in social value w for any two entrepreneurs financed by values-aligned social investors. And Lemma 3 also carries over to the case with both types of social investors. So long as social capital is sufficiently scarce, impact-aligned social investors never finance an entrepreneur that could have attracted commercial capital.

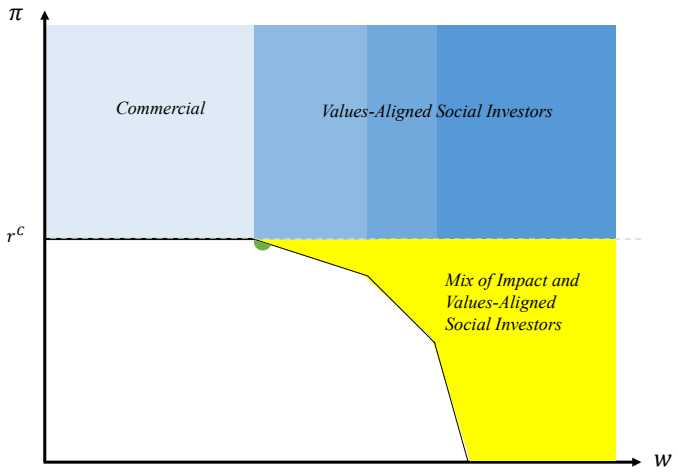

Figure 3: Equilibrium investment with both types of social investors

A generic equilibrium allocation is depicted in Figure 3.

3.4 Reallocating Values-Aligned Social Capital to Improve Social Welfare and Financial Returns

In this section we consider the following thought exercise. Holding fixed the equilibrium behavior of all other investors, we consider the possibility of reallocating the investment of a single values-aligned social investor. We demonstrate that any values-aligned social investor who supports a firm with $\pi_i \geq r^C$ and who earns a financial return of $r_i < r^C$ could reallocate their capital to increase total social welfare *and* increase their financial return. In this sense values-aligned investors leave both money and impact on the table.

Proposition 2. *Consider any values-aligned social investor i that supports a firm with $\pi_i > r^C$ and earns a return $r_i < r^C$ in equilibrium. If the distribution of firms is sufficiently dense, there exists an unfinanced firm j with profits $\pi_j > r_i$, such that if the values-aligned social investor i were to deviate and offer firm j financing at cost π_j, total social welfare would*

increase as would investor i's financial return.

In the proof of Proposition 2 we formalize the notion that the distribution of entrepreneurs is *sufficiently dense*. Intuitively, it guarantees that for any combination of π and w, there is an entrepreneur with profits π_i near π and social value w_i near w. Proposition 2 can be understood with reference to Figure 3. Fix any values-aligned social investor i that supports a firm i with profits $\pi_i \geq r^C$ and who earns financial return $r_i < r^C$ (generically this holds for all values-aligned investors who support firms with $\pi_i \geq r^C$). These investors support the firms highlighted in the three darker shades of blue. And consider among the set of unfinanced firms some firm j with profits $\pi_j > r_i$ and with social value $w_j > 0$. This firm is guaranteed to exist by the assumption that the distribution of firms is dense. One such firm is highlighted in green.

The contribution to social welfare of the equilibrium investment for investor i is 0, regardless of the social value w_i of firm i, as investor i is merely displacing commercial investment. Firm j creates less social value than any firm in the blue region of the diagram, but by reallocating investor i's capital to firm j social welfare increases, as firm j was previously unfinanced.

Further, by offering firm j a cost of capital $r_j = \pi_j$, investor i can earn higher financial return as well. As with social value, firm j earns lower profits than any firm in the blue region of the diagram. But because $\pi_j > r_i$, the subsidy required to make firm j profitable is smaller than the financial concession (relative to the commercial rate of return) that investor i made to own firm i. Critically, values-aligned social investors compete down the price of capital of firms with large contributions to social value even when these firms could have attracted commercial financing. The financial compromise made by values-aligned investors to support such firms results in a transfer of wealth to the entrepreneur rather than expanding the pool of socially valuable firms. In contrast, the financial compromise made to support a firm that could not attract commercial financing goes entirely toward expanding the pool of socially

valuable firms rather than transferring rents to entrepreneurs whose projects would anyway have been feasible.

We note that the proof of Proposition 2 relies on allowing the deviating values-aligned investor to extract the full profit of the previously unfinanced firm highlighted in green in Figure 3. However this feature of the model is not necessary for the result. The critical ingredient is that values-aligned investors bid up the price of some firms in a way that does not contribute to aggregate social value (i.e. by competing up the price of socially valuable projects that would have occurred even at the commercial cost of capital). So long as there is a way to reallocate a portion of that financial concession in a way that *does* contribute to social value (e.g. by donating it to charity), then the deviating values-aligned investor can reduce the total financial concession and allocate the remainder in a way that creates social value – this increases both impact and financial return.

Finally, we note that while there exist opportunities for values-aligned investors to increase their financial return and social impact, these opportunities do not increase the utility of values-aligned social investors (who place intrinsic value on the social value of the company they finance). That is, for investors who truly hold values-aligned preferences the deviation we have analyzed would not be attractive. Nevertheless, in Section 5, we provide evidence that some investors who employ values-aligned strategies are willing to deviate to investments that increase their financial return and impact (and, parallel to the discussion above, that have lower social value than their original investments). Thus, Proposition 2 may offer useful guidance for increasing the impact of social investing.

3.5 Enterprise Impact

How should one judge the contribution to social welfare of a particular entrepreneur, sometimes referred to as *enterprise impact* (e.g. Brest et al., 2016)? On first pass it might seem natural for w_i to be the measure of enterprise impact. However, we argue that a firm's

enterprise impact should also account for the social value of the capital it employs.

For simplicity, in this section we assume that all social investors have homogenous altruism parameter θ. Let $W(S_V, S_I)$ be the total social value created in equilibrium given masses of values-aligned investors S_V, and impact-aligned investors S_I. Define ν_{S_V} to be the increase in social value corresponding to adding one additional values-aligned social investor, and ν_{S_I} to be the increase in social value corresponding to adding one additional impact-aligned social investor. The social value of commercial capital, ν_C, is normalized to 0. It is straightforward to show that $\nu_C < \nu_{S_V} < \nu_{S_I}$.

We define the enterprise impact of firm i to be $e_i \equiv w_i - \nu_i$ where ν_i is the social value of capital attributable to the investor who supports entrepreneur i in equilibrium. We define the enterprise impact to be 0 for firms that do not receive financing. Enterprise impact e_i corresponds to the change in total social value created in equilibrium from adding firm i to the market.

This definition of enterprise impact might have practical value for socially motivated investors aiming to quantify the social value of a particular enterprise. Frontier efforts in the impact investing industry often attempt to account for the social value created by the enterprise and the amount of capital employed by the enterprise, such as in the *impact multiple of money* method (Addy et al., 2019). Our analysis highlights that it is also critical to account for the composition of social capital versus commercial capital raised by an enterprise in judging its impact.

This definition of enterprise impact also highlights an alignment between the enterprise impact and profitability of a firm. Firms can increase their enterprise impact by increasing their profitability *even holding fixed their social value* w_i. Increasing the profitability of the firm makes it more likely to attract commercial capital, freeing up capital that is willing to accept lower returns to fund higher social value endeavors. In particular, we have the following result.

Proposition 3. *Suppose firm i attracts financing from an impact-aligned social investor in equilibrium. Increasing its profits π_i while holding fixed its social value w_i weakly increases its enterprise impact e_i and total social value created in equilibrium.*

Importantly, this result is not driven by an assumption that a firm's profitability and its social value are correlated. Instead, this result is driven by the observation that once a firm becomes profitable enough to attract commercial financing, impact-aligned social investors will step aside, freeing up their capital to support another socially valuable firm. Therefore, more profitable firms use less socially valuable capital, and have higher enterprise impact. Note that this phenomenon does not hold for firms supported by values-aligned social investors, as values-aligned social investors pay no regard to whether a firm could attract commercial capital in their absence.

4 Incomplete Information

A key challenge in socially motivated investing is evaluating how a given investment opportunity satisfies the social dimension of an investor's preferences. The results of our model suggest this may be particularly hard to do for investors who have preferences for achieving impact. Both values- and impact-aligned strategies require knowing the social value of the set of available investments. But impact-aligned strategies also require knowing whether or not other investors, with their own social preferences, would provide financing for these investment opportunities. In more realistic informational environments, with uncertainty about whether a firm could attract capital from less socially-minded investors, how can impact-aligned investors operationalize their preference for impact? Which dimensions of the informational environment are particularly important for being able to create social impact as an investor? To shed light on these questions, we explore a version of our model with informational frictions that prevent investors from perfectly determining both the social

value of projects and the investor's own pivotality in realizing that social value through their potential investment.

4.1 Impact-Aligned Investment Strategies Under Incomplete Information

We modify our baseline model to incorporate incomplete information as follows. Instead of a firm having publicly-observable profits $\pi_i \in \mathbb{R}^+$ social value $w_i \in \mathbb{R}$, these quantities now represent public signals of *expected* profits and social value, respectively. Entrepreneurs have private information about their true type, $(\pi^i, w^i) \in \left\{\pi^L, \pi^H\right\} \times \left\{w^L, w^H\right\}$,with $\pi^H > r^C > \pi^L$ and $w^H > w^L$. Public signals thus map into probabilities of being the high profit and high social value types. Without a loss of generality, we normalize $w^L = \pi^L = 0$ and $w^H = \pi^H = 1$ and thus interpret π_i and w_i as the probabilities firm i being the high profit and social value types. We assume that for all firms i, $\pi_i \in (0, 1)$, so that every firm has a positive probability of being the high or low profit type. As in Section 2, we make no assumption about the joint distribution of (π_i, w_i), although we assume that for a given observable type (π_i, w_i), realizations of π^i and w^i are independent. For simplicity, we assume that all social investors have uniform alturism θ.

We now turn to characterizing the investment strategies of impact-aligned investors in the incomplete information model. Parallel to the model with complete information, impact-aligned social investors aim to support firms that not only have high social value but also are unlikely to attract commercial financing. In the absence of impact-aligned social capital, each firm i will receive financing if and only if $\pi^i = \pi^H$. Recall that while the true profit type is private information, we assume it is not feasible for firms to obtain capital at rates $r > \pi^i$.

Since we assume $\pi^H > r^C > \pi^L$, no low profit type can obtain commercial financing, and all high-profit types are able to access commercial financing. Therefore, the probability

that an impact aligned social investor is pivotal in financing a given firm i is $1-\pi_i$, the probability the firm is the low profit type. Further, notice that whenever impact-aligned investors offer financing, they do so at a rate $r_i = \pi^L$. This is because offering financing at a higher cost could only be accepted by firms of the high-profit type, which would generate no social value, and such firms would only accept offers of $r \leq r^C$, which is dominated for the investor by putting their funds in the outside commercial capital market and earning r^C.

These two observations imply that in equilibrium, impact-aligned social investors finance the firms i with the highest values of

$$\pi^L + \theta\left(1-\pi_i\right) w_i$$

because financing such a firm would give financial return π^L and an expected contribution to social welfare of $\left(1-\pi_i\right) w_i$.

Define $\bar{u}^S$ such that $\left|\left\{i \in E : \pi^L + \theta w_i\left(1-\pi_i\right) \geq \bar{u}^S\right\}\right| = |S|$. Social capital is scarce if $\bar{u}^S > r^C$, the natural extension of Assumption 1. This leads to the following characterization of the firms financed by social investors:

Proposition 4. *Assume social capital is scarce, ie $\bar{u}^S > r^C$. Then impact-aligned social investors finance all projects with (π_i, w_i) satisfying:*

$$w_i \geq \bar{u}^S/\theta\ ,\ \ \pi_i \leq \bar{\pi}\left(w_i\right) \equiv 1 - \left(\bar{u}^S - \pi^L\right)/(\theta w_i)$$

In line with Proposition 4, the left panel of Figure 4 depicts the equilibrium allocation of social capital under incomplete information. Thicker horizontal bars denote higher likelihood of commercial financing. Proposition 4 generates an immediate corollary:

Corollary 1. Under incomplete information, impact-aligned investors finance high profit high social value firms. That is, for any w, there is a $\bar{\pi}\left(w\right)$ such that impact-aligned investors will finance any firm with $w_i = w$ and $\pi_i \leq \bar{\pi}\left(w\right)$, with $\bar{\pi}\left(w\right)$ increasing in w.

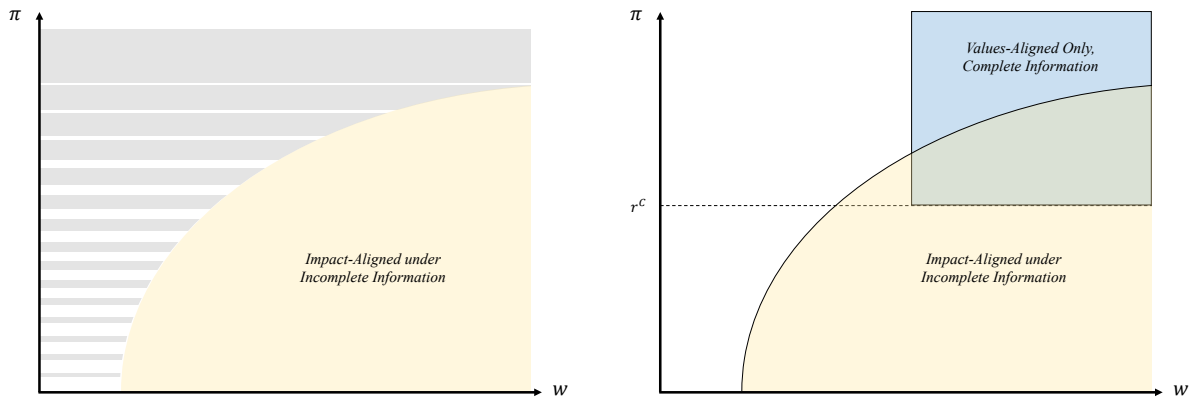

Figure 4: Allocation of Capital with Incomplete Information

Corollary 1 shows that when there is incomplete information about which firms are commercially viable, the behavior of impact-aligned social investors resembles that of values-aligned social investors in the complete information model. The right panel of Figure 4 demonstrates this graphically. It simultaneously shows how impact-aligned investors allocate capital under incomplete information, and, from Figure 3, the region of investment opportunities where values-aligned investors are the exclusive providers of capital under complete information about fundamentals. Under incomplete information, impact-aligned investors are willing to finance some firms with high social value and high expected profits, as there remains a chance that some of these firms are not commercially viable. Therefore, the observation that in practice, many social investors finance projects that are both high profit and high social value does not necessarily imply that these investors are employing values-aligned strategies. Rather, their behavior may be consistent with the efficient creation of impact in the face of uncertainty about their own pivotality.

A key takeaway from the above analysis is that incomplete information about profitability affects investors' ability to assess whether their investment would be pivotal and thus generate social value. This occurs because incomplete information about profitability induces uncer-

tainty about which investments could attract commercial capital. Other forms of incomplete information could also affect an impact aligned investor's assessment of how likely they are to be pivotal, but through other channels. For example, incomplete information about the preferences and strategies of other investors, how much social capital is available, and the distribution of potential investment opportunities can affect inference on which opportunities could attract other social investors. We conjecture that in all these cases, impact-aligned investors will form strategies that weigh expected returns and expected impact, with the latter accounting for how incomplete information affects the equilibrium probability a given investment would be pivotal. We leave for future research a more detailed characterization of how these various forms of incomplete information affect investment strategies and equilibrium capital allocation.

5 Empirical Evidence and Practical Implications

In this paper we have analyzed a model of the behavior of investors with different types of social preferences. How prevalent are impact- and values-aligned investing preferences in practice? Are all investors correctly operationalizing their preferences through their investment strategies, or are some investors who have a preference for impact mistakenly following values-aligned strategies? In this section we analyze novel survey data to shed light on these questions.

We have two primary findings. First, we find significant heterogeneity in the preferences of investors. We identify three classes of social investors based on their choices among investment opportunities in a laboratory setting; those whose choices match the behavior of impact-aligned investors in our model, those whose choices match values-alignment, and those whose choices match commercial investors. Second, we show that social preferences revealed by investment strategies do not perfectly match stated preferences–a sizable fraction of participants who adopt values-aligned investment strategies in our survey have stated

preferences for generating impact. Further, in line with Proposition 2, among those making choices consistent with values-aligned preferences, half are willing to change their choices when they are shown that doing so would increase social impact and improve their financial returns. This suggests the findings of our paper are potentially important–the observation that a large amount of socially-motivated investing takes the form of values-aligned strategies need not imply these investors do not care about social impact.

Our analysis in this section builds on the work of Bonnefon et al. (2023), which also elicits willingness-to-pay for social attributes of investment opportunities and employs charitable donations as a proxy for social value. Our analysis differs in three key ways. First, we explicitly account for the possibility of heterogeneity in social investing preferences. Second, our survey intrument elicits preferences from pairwise choices, while Bonnefon et al. (2023) elicits willingness-to-pay for individual stocks. These differences could explain our finding that a portion of the population has significant willingness to pay for impact, whereas Bonnefon et al. (2023) does not find statistically significant evidence that the representative social investor is willing to pay to achieve social impact. Third, we demonstrate that some of the investors who follow values-aligned strategies may in fact have impact-aligned preferences.

5.1 Overview of Survey Exercise

We employ a laboratory-style elicitation exercise to infer the preferences of investors. In November 2023 we recruited 400 participants on the Prolific online survey and experiment platform. We screened for respondents that were based in the United States and have financial investments in the stock market.

In the experiment, we asked participants to indicate in a series of scenarios, $s = 1, ..., S$, which of two potential stocks k and k' they found more appealing. The attributes of each stock k are its financial return $r_k \in \{\$3.00, \$3.50, \$4.00, \$4.50\}$, its social value, operationalized as the charitable donation that company makes to the charity Feeding America,

$w_k \in \{\$0.50, \$1.00, \$1.50, \$2.00\}$, and whether the investor's purchase of the stock is pivotal in generating the company's charitable donation, $p_k \in \{0, 1\}$. The cost of investing in a stock is normalized to zero, so an investor who chooses a stock with return r receives a payout of $\$r$. Figure 5 shows one of the choice decisions in our experiment.

The fact that realizing social value can be a function of the investment decision captures the notion of investor impact. In the survey introduction we use an example scenario to explain in detail how this works in our experimental setting. We explain to participants that if neither company's charitable donation depends on the participant's investment, their choice has no effect on the total charitable donation. If both companies' donations depend on the participant's investment, the only charitable donation will come from the company whose stock they purchase. If only one of the companies' donations depends on the participant's investment, the participant increases the amount of charitable donation occurring only by choosing that company's stock. For example, in the question shown in Figure 5, choosing to invest in Company A results in a \$1.00 donation to charity. On the other hand, because Company A will donate regardless of the investment decision, choosing to invest in Company B stock results in a \$1.50 donation to charity, even though Company B itself is only donating \$0.50 to charity.

The amount of social value generated in a scenario choosing between stock k and k' is a function of the participant's investment choice as follows:

$$w^{agg} = w_k i_k^{p_k} + w_{k'} (1 - i_k)^{p_{k'}}$$

where i_k is an indicator of whether the participant invested in stock k. Participants were each asked $S = 14$ of these questions and three attention checks in a random order. Participants were told that one of these 14 decisions would be selected at random, and would be used to determine their real-life compensation for completing the experiment. This compensation consists of a cash payment made to the participant as well as a real

donation to Feeding America made on behalf of the participant. These payment amounts are equal to the financial return of the stock the participant chose and the total charitable donation realized in the randomly selected scenario, respectively. This reward structure ensures that participants are incentivized to answer each question honestly. We drop the 11 participants who failed any of the three attention checks, leaving us with a sample of 389 participants. Further details about the study and a list of the investment scenarios are contained in Appendix C.

Each question is designed so that the answer reveals something about the preferences of the participant. For example, consider the question shown in Figure 5. Choosing Company A stock is consistent with values-aligned preferences. It offers a lower financial return but has a higher social value association than the alternative option. Choosing Company A stock reveals the participant was willing to incur \$0.50 lower financial return and \$0.50 lower social impact in order to obtain \$0.50 higher social value association. Twenty three percent of respondents in our sample chose company A in this scenario. By presenting investors with a series of choices between two assets with distinct characteristics, we can estimate the strength of their preferences for values- and impact-alignment.


Consider the following scenario of two options for a stock to purchase:

	Company A Stock	Company B Stock
Your Financial Return	\$3.00	\$3.50
Company's Charitable Donation	\$1.00	\$0.50
Donation Requires Your Investment	No	Yes

Which stock would you prefer to buy? **Company A** or **Company B**?

Figure 5: Example Lab Experiment Question

Of the 14 investment scenarios, six were structured to also explore the possibility that investors may have impact-aligned preferences but may be incorrectly operationalizing them through values-aligned strategies. As described in more detail below, depending on their

responses to these questions, participants may be asked follow up questions about their choice after the main survey.

5.2 Experiment Results

5.2.1 Willingness to pay for impact and values alignment

Our first results regard the relative strength of values- and impact-aligned preferences. Our focus is to identify the degree to which investors are heterogeneous in their social preferences, and the degree to which this heterogeneity maps on to the three types of preferences we study in our model: purely financially motivated, values-aligned preferences (placing monetary value on w but not on pivotality), impact-aligned preferences (placing value on w only in cases where the investment is pivotal).

To this end, we use the pairwise choice data from our experiment to estimate preferences over values and impact alignment, accounting for heterogeneity in preferences across latent classes. We assume utility of individual j owning a stock k is given by

$$u_{j,k} = \beta^r_{c_j} r_k + \beta^v_{c_j} w_k + \beta^i_{c_j} w_k p_k + \epsilon_{j,k}$$

where r_k is the return of the stock, w_k is its social value (charitable donation), and p_k is an indicator of whether the investor needs to purchase this stock in order for charitable donation to occur. Further, c_j is the latent class of which individual j is a member and preference parameters β are class-specific. Each individual j has an ex-ante probability π_c of belonging to class $c \in 1, .., C$. We assume idiosyncratic taste shocks $\epsilon_{j,k}$ follow a Type I extreme value distribution. With $C > 1$ we can account for discrete heterogeneity in the preferences for values-alignment and impact-alignment and estimate class membership probabilities π_c and class-specific preference parameters β_c as a latent class logit model (Greene and Hensher, 2003, Heckman and Singer, 1984).

	Class 1	Class 2	Class 3
WTP Values	0.197***	0.724***	0.060
	(0.020)	(0.053)	(0.048)
WTP Impact	0.166***	-0.167***	0.903***
	(0.018)	(0.058)	(0.045)
Class Share	0.368	0.288	0.344

Table 1: Estimation of Willingness to Pay for Social Attributes of Stocks in a Laboratory Experiment

Consistent with our theory, we specify $C = 3$ latent classes. Table 1 shows the results of this exercise. The three columns specify the estimates of willingness-to-pay for impact and values for each of the three latent classes, as well as their estimated class shares.[10]

Strikingly, the estimation results reveal preference heterogeneity that closely corresponds to the different types of investors in our theoretical model. "Class 1" has relatively little willingness-to-pay for either impact or values–these correspond to the commercial investors in our framework. The other classes have stronger social investing preferences. "Class 2" has a strong preference for values alignment. On average, investors of this type are willing to forgo \$0.72 of financial return in exchange for a \$1 increase in values alignment of their investment decision. This group has much lower preference for impact. "Class 3" is consistent with impact-aligned investors in our model. They have a strong willingness-to-pay to achieve social impact, with a willingness-to-pay for impact of \$0.90, but no willingness-to-pay for values alignment.

A potential concern with this analysis is that it is not capturing true heterogeneity in individual preferences and that instead these results arise mechanically or spuriously.

[10]As standard in the discrete choice modeling literature, willingness-to-pay for values and impact are measured by β^v/β^r and β^i/β^r, respectively. These quantities represent the compensating increase in values or impact of a stock that would leave an investor indifferent to a \$1 decrease in its financial return.

There are several reasons to reject this concern. First, we can show that the estimation is capturing individual-level rather than choice-level preference heterogeneity. Estimation of the model above also allows us to compute respondent-specific posterior probabilities of class membership implied by their choices in the experiment. Posterior probabilities of modal class membership are very high–95% of respondents have a modal class membership probability of over 80%. The preference heterogeneity we document is thus arising across, rather than within, individual participants in the experiment.[11] Second, simulated choice data does not generate these patterns of results. The presence of multiple clusters is consistently rejected when response data is generated from homogeneous preferences. Together, this suggests the above analysis provides compelling evidence that impact and values alignment are both ways people think about socially motivated investment.

5.2.2 Are investors making mistakes?

One fundamental message of this paper is that for investors to most efficiently have social impact, they need to prioritize making investments that could not attract less altruistic capital. That message would be especially important if there are investors who want to have an impact but are mistakenly adopting values-aligned strategies. Our survey exercise generates two pieces of evidence suggesting that some investors who adopt values aligned-strategies are indeed making a mistake.

First, we compare the stated social preferences of investors in our survey to the preferences revealed by their choice behavior in our investment scenarios and find a sizable number of investors who adopt values-aligned investment strategies in fact self-report as having impact-aligned preferences. To collect stated social preferences, the survey described values-aligned

[11] Posterior class membership probabilities also line up well with other ways of capturing heterogeneity in our response data. In particular, we apply the $k - means$ algorithm to separate participants into three clusters based on their choices in all 14 scenarios. These cluster assignments are highly correlated with posterior modal class memberships we estimate above. In particular, these two classification methods agree on group assignments for 315 of 389 individuals in the data.

investing and impact-aligned investing objectives and asked which, if any, the participant identified most with.[12] Of the 389 respondents in our sample, 125 identified as impact-aligned investors, 144 identified as values-aligned investors, and 120 stated they did not incorporate social considerations into investing decisions. To measure revealed preferences, we use the respondent's modal posterior class membership from the model estimated in the previous section. Among the participants identified by their choice data as employing values-aligned strategies, 30 percent self-reported as having impact-aligned preferences.

We now turn to our second piece of evidence that some investors who adopt values aligned strategies are doing so mistakenly. As mentioned above, of the 14 investment scenarios, six were structured to also explore this possibility. In each of these six scenarios, one choice is only consistent with values-aligned preferences–it requires giving up both (weakly) higher financial returns and strictly higher social impact to attain higher values alignment. At the end of the survey we present followup questions to participants that picked the low-return/high-values stock in at least one of these scenarios. In the followup questions, in the spirit of Proposition 2, we point out that the participant could have earned at least as much money, but generated more social impact by picking the other stock. We then ask if they would like to revise their answer. See Appendix C for the exact language of the followup question.

Note that if the initial decisions of investors reflected their true preferences, no participant would revise their decision when presented the opportunity to do so. In contrast, if participants truly have a preference for creating impact and to operationalize it were applying a heuristic of investing in companies with the higher social value, then we should expect some of these participants to change their behavior when it is explained to them that a different choice would provide a higher social impact and generate a higher financial return.

In our data, 59% of participants chose the values-aligned option in at least one of these six scenarios and hence were presented with an opportunity to revise their decision. Of

[12]See Appendix C for the full wording of this question.

those, 109 out of 231 revised their choice in every opportunity they were given to do so. This shows that nearly half of the participants whose choices indicated values-aligned preferences may in fact have a preference for impact that was not reflected in their initial investment decisions. This supports a normative interpretation of our results; some investors that are implementing values-aligned strategies in practice might be doing so in error and following the impact-aligned investment strategies in our model could improve their welfare and social impact.

6 Conclusion

This paper provides a new framework to understand how values-based investing generates social impact in an environment where social and commercial investors compete. We analyze a model in which investors influence social outcomes through their asset allocation, and show that equilibrium asset allocation differs in important ways depending on precisely how social investors think about social value creation.

Investors following values-aligned investment strategies, which closely resemble the construction of conventional ESG and emissions reduction portfolios, have limited impact because they displace commercial investors who do not care about social value creation but would have supported some socially valuable companies anyway. Further, because values-aligned investors place intrinsic value on owning socially valuable firms, they compete with one another and push up the price of firms that could have been financed by commercial investors. From the perspective of generating impact, we show that this financial concession is inefficient. We identify an alternative investment approach, which only makes financial concessions to subsidize firms that would not be viable at the commercial cost of capital, and which generates more impact and also higher financial returns.

We demonstrate two further implications of the idea that impact can arise from not displacing investors who care less about social value. First, we show that when there is

heterogeneity in the altruism of impact-aligned investors, the equilibrium involves negative assortative matching–high altruism investors finance lower social value projects so as to avoid displacing lower altruism investors from investing in high social value projects. Second, from a firm's perspective, we show that making a firm more profitable can also make it more impactful. Social investors who care about their financial return and their contribution to social value seek not to invest in firms that could have attracted commercial capital. Taking a firm that would have been financed by an impact-aligned investor, and making it more profitable, allows it to utilize less socially valuable capital and frees up the impact-aligned capital to support a new firm.

Next we consider more realistic informational environments where impact-aligned investors cannot perfectly infer when their investment in a firm would be pivotal and have impact. In particular, under incomplete information about firm profitability, impact aligned strategies resemble values-aligned strategies in a complete information environment. More generally, because incomplete information affects impact-aligned investors' ability to identify investment opportunities that would not have been funded by others, it limits the ability of these investors to generate impact. This suggest that impact-aligned investors should focus on measuring and generating improved information about not only the social value of investment opportunity, but also its ability to attract capital from other investors. How to do so optimally is an interesting question for future research.

Finally, the practical importance of our findings hinges on the degree to which social investors have preference for impact creation, and the degree to which some social investors with a preference for impact creation incorrectly operationalize them through values-aligned strategies. We provide novel empirical evidence documenting that a sizable fraction of investors have preference for impact alignment and indeed many of these investors incorrectly operationalize that preference. These empirical findings underscore the relevance of our theory.

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Internet Appendix

A Model Extensions

In this section we consider a variety of extensions to demonstrate the robustness of the results in Section 3 to alternative model specifications.

A.1 Endogenizing the Commercial Market

In this section, we endogenize the commercial market and make explicit how it is impacted by the presence of social investors. In doing so, we have two goals. The first is to develop a version of the model where both values- and impact-aligned social investors can have an impact through raising the cost of capital for socially harmful firms. And the second is to demonstrate that within this version of the model, our key results are robust.

To endogenize the commercial capital market, we make the following extensions to the model in Section 2. Rather than elastically supplying capital at exogenous rate r^C,there is now a finite set of commercial investors C, each of which allocates one unit of capital, and makes financing offers to maximize their return r_i. After observing social investors offers, commercial investors make offers to entrepreneurs. This can be understood as representing the commercial market as the "outside option" of entrepreneurs who fail to attract capital from more specialized, social investors. From a technical standpoint this feature is necessary so that impact-aligned social investors can anticipate when their capital will be pivotal for a given firm versus when that firm could regardless attract financing from commercial investors. Finally, because we now explicitly model commercial capital, investors do not have access to an outside investment opportunity.

Model Analysis

We begin by analyzing the case of values-aligned investors. We solve the model working backwards from the commercial offer stage. Unlike in the baseline case, r^C is now set endogenously. For each entrepreneur i let $\bar{r} = \min\{\pi_i, r_i^*\}$ where r_i^* is the best offer that entrepreneur i received in the social offer stage, if she received any at all, and $\bar{r}_i = \pi_i$ if entrepreneur i received no offers in the social offer stage. $\bar{r}_i$ is the highest cost financing that an entrepreneur would find acceptable from an investor in the commercial offer stage. In equilibrium commercial investors offer capital to the set of entrepreneurs willing to accept the highest offers. Therefore, the market clearing commercial cost of capital r^C solves

$$r^C = \max r \;\; \text{st} \;\; |\{i \in E : \bar{r}_i \geq r\}| = |C| \tag{5}$$

In words, the equilibrium commercial cost of capital is the highest cost of capital such that the set of entrepreneurs willing to accept it has the same cardinality as does the set of commercial investors. In equilibrium then, all such entrepreneurs are offered a cost of capital r^C, and all of them accept their offers. If all commercial investors contract at r^C, then no commercial investor can profitably undercut another, and there is no profitable deviation in offering capital to an entrepreneur not currently financed by a commercial investor, for whom $\bar{r}_i < r^C$.

Moving backwards to the social offer stage, prices and allocations are determined in the same manner as in the baseline model. The incentive compatibility condition governing accepted contracts is still Equation 3. Therefore, Lemmas 1 and 2 still hold and equilibrium sorting is unchanged.

We now turn to the case where social investors are impact-aligned. The commercial offer stage works exactly as in the values-aligned case. Moving backwards to the social offer stage, there is only one important difference relative to the baseline model. In the baseline model, when a social investor offers capital to a firm i with $\pi_i > r^C$, the investor

rationally anticipates that this would contribute nothing to social value, as the firm would be financed regardless. In contrast, in the present model, an impact-aligned investor who finances a commercially viable firm would anticipate that this would marginally expand the set of firms that are financed by commercial investors.

Let c' represent the firm that marginally misses commercial financing. Formally, letting E^C be the set of entrepreneurs who receive commercial financing in equilibrium c' is the firm that solves

$$c' = \underset{i \in E \setminus E^C}{\text{argmax}} \bar{r}_i$$

When a social investor deviates from their equilibrium matching and finances a firm that is commercially viable, their contribution to social welfare is $w_{c'}$ – the social impact corresponding to marginally expanding the pool of commercial capital – rather than 0. Nevertheless, under Assumption 1 from our baseline analysis, Lemma 3 and Proposition 1 continue to hold and equilibrium sorting is unchanged relative to the baseline case.

Expanding the Pool of Social Capital

We now consider the comparative static of converting commercial investors into social investors. This can be understood as modeling divestment. For the following proposition, we assume that all social investors have the same level of altruism θ. Let $r_i(c, s)$ be the equilibrium cost of capital provided to entrepreneur i when there are c commercial investors and s social investors, and let $r^C(c, s)$ be the corresponding equilibrium commercial cost of capital. We begin with the case where social investors are values-aligned.

Proposition 5. *When social investors are values-aligned, there exists a $\bar{w}$ such that for all entrepreneurs i with $w < \bar{w}$, $r_i(c, s) \leq r_i(c-1, s+1)$ and for all entrepreneurs i with $w \geq \bar{w}$, $r_i(c, s) \geq r_i(c-1, s+1)$.*

That is, converting one commercial investor to a social investor raises the equilibrium cost of capital for firms with low social value and lowers the equilibrium cost of capital for

firms with high social value. Adding one additional social investor to the market pushes out the frontier of firms financed by social investors, implying that the marginal firm financed by social investors is weakly less attractive as judged by its combination of financial return and social value. By Equation 3, this increases competition among social investors for every enterprise they finance, and so pushes down the cost of capital for these firms. Conversely, removing a commercial investor reduces competition for firms that were previously commercially financed, raising their cost of capital.

We now turn to the case where social investors are impact-aligned.

Proposition 6. *When social investors are impact-aligned, for all entrepreneurs i with $\pi_i \geq r^C(c,s)$, $r_i(c,s) \leq r_i(c-1,s+1)$.*

In the impact-aligned case, converting a commercial investor to a social investor weakly increases the cost of capital for firms with relatively higher profits, as removing a commercial investor reduces price competition amongst firms that receive commercial financing. Because impact-aligned social investors are not incentivized to undercut one another, adding one more social investor to the market does not reduce the cost of capital for existing firms financed by social investors.

Robustness of Propositions 2 and 3

The logic of Proposition 2 is similar to the baseline case and can be understood with reference to Figure 3. In the baseline case, when a values-aligned investor i deviates to finance the firm highlighted in green, the firm that i previously financed is instead financed by a commercial investor with no consequence for the other commercially financed firms. In the present model, when a values-aligned investor i deviates from their assigned firm, this causes a reallocation of capital in the commercial offer stage, and one firm is no longer financed. Specifically the firm

$$c'' = \underset{i \in E^C}{\text{argmin}} \pi_i$$

no longer attracts financing from any firm. However, so long as the firm j in green satisfies $w_j > w_{c''}$, the proposed deviation will still result in an increase in social welfare. The argument that investor i also enjoys a higher financial return is the same as in the baseline case.

The logic of Proposition 3 is also similar to the baseline case. Specifically, sufficiently raising the profitability of a firm i that is financed by an impact-aligned investor will induce it to instead be financed by a commercial investor, freeing the impact-aligned capital to finance another socially valuable project. The only difference relative to the baseline case is that when firm i switches to raising commercial capital, the firm c'' defined above no longer attracts commercial finance. Again, so long as the new firm financed by an impact-aligned social investor has higher social value than c'', which is guaranteed to be the case at least weakly, this will result in an increase in total social value.

A.2 Impact on the Intensive Margin

In the baseline model we assumed that every firm has a single project, which is completed if and only if it raises a unit of capital. Within this setting, we demonstrated that there are deviations from equilibrium values-aligned investment strategies that improve both financial return and social impact. However, our proposed alternative investment strategy required that investors allocate their capital to firms that are not commercially viable. In reality, this may only be possible in private capital markets, which is likely infeasible for small investors. In this section we consider a variant of the model in which firms have continuous, concave production functions and demonstrate that social investors *can* have impact by inducing commercially viable firms to change their scale of operation. Therefore, there may be room for social investors to induce change in public markets.

The economic logic in the continuous-project case is largely the same as in the binary-project case. Values-aligned investors bid up the prices of firms with high average social

value while impact-aligned investors target their subsidies to firms with socially valuable but marginally unprofitable projects. Relative to the binary-project case, some new insights emerge. Impact-aligned investors maximize their impact by leveraging commercial capital. In equilibrium a capital structure emerges in which commercial and impact-aligned investors co-invest in the same firms at different terms, referred to as "blended finance" in the impact investment community.[13] In contrast, values-aligned investors never finance the same firms as commercial investors.

Model

Agents, Technology, and Contracts

The model in Section 2 is now modified in the following ways. First, rather than assuming that firms have projects of binary scale, we now assume that each firm i can absorb any positive mass of capital k. Firm i then produces $\pi_i(k)$ profit and $w_i(k)$ social value. Both functions are increasing, concave, and continuously differentiable, although the case where $w(\cdot)$ is at some points decreasing could be easily accommodated. We maintain the assumption that there is a finite set of social investors denoted by S, each of whom owns one unit of capital. However, now capital is divisible so that in principle one investor could finance several firms. There is a market for commercial capital that elastically supplies financing to all firms at rate r^C. Social investors can also allocate their capital to a "social value-neutral" asset with financial return r^C and 0 social value.

A contract between an investor and entrepreneur now specifies not only the cost of capital r, but now also the amount of capital x, and a minimum-scale contingency k, discussed below. A contract is therefore represented by $\langle x, r, k \rangle$, where r represents the cost of 1 unit of capital.

[13] The term "blended finance" is increasingly prevalent amongst impact investors in practice. The International Finance Corporation of the World Bank defines blended finance as "the use of relatively small amounts of concessional donor funds to mitigate specific investment risks and help rebalance risk-reward profiles of pioneering investments that are unable to proceed on strictly commercial terms. Concessional funds are structured as co-investments, with an expectation of reflows for future investments or other uses."

The minimum-scale contingency can also be left unspecified, represented by $\emptyset$.

Preferences

For simplicity we focus on the case where investors have a homogenous altruism parameter $\theta \in \mathbb{R}$. Let x_i^j be the amount of capital that investor i allocates to firm j in equilibrium, r_i^j be the cost of capital that investor i charges firm j and $\bar{k}_j$ be the mass of capital raised by firm j. A values-aligned social investor i's utility is represented by

$$\sum_j x_i^j \left(r_i^j + \theta \frac{w_j\left(\bar{k}_j\right)}{\bar{k}_j} \right). \tag{6}$$

That is, values-aligned social investors care about their total financial return and social value of the firm they finance, weighted by their ownership share.

In contrast, an impact-aligned social investor i's utility is represented by

$$\sum_j x_i^j r_i^j + \theta \sum_j w_j\left(\bar{k}_j\right) \tag{7}$$

That is, impact-aligned social investors care about their financial return and the total social value created by all firms, regardless of who finances them.

Entrepreneur j has preferences represented by $\pi_j\left(\bar{k}_j\right) - r^j$, where $r^j \equiv \sum_i x_i^j r_i^j$, and the sum is taken over all contracts the entrepreneur accepts from investors i. That is, entrepreneurs maximize firm profit net of the cost of external capital.

Timing

First, all social investors offer a contract to an entrepreneur. Simultaneously, entrepreneurs receive offers from the commercial market for an arbitrary amount of capital at rate r^C. Second, entrepreneurs accept any number of such contracts and operate at scale $\bar{k}_i$, where $\bar{k}_i$

represents the mass of capital they have accepted. Entrepreneurs may only accept a contract that specifies a minimum-scale contingency k if they operate at a scale $\bar{k}_i \geq k$.[14]

Finally, we maintain the solution concept is pure-strategy Subgame Perfect Equilibrium.

Discussion of Minimum-Scale Contingency

The minimum-scale contingency gives investors the ability to influence a firm's scale on the margin. Without it, if an investor offered a firm cheaper capital than it could attract on the commercial market, the firm may merely accept that capital as a substitute for more expensive capital without changing its scale. A minimum-scale contingency was implicit in the binary-project model because by definition, if an investor offered subsidized capital to a firm that could not attract commercial financing, it would necessarily operate at a larger scale. Unlike in the binary-project model, in the continuous case social investors may desire to change the scale of a firm that could attract a non-zero amount of commercial capital, and the minimum-scale contingency offers them a route to do so. Minimum-scale contingencies resemble green bonds in that they require a firm undertake a specific project (or reach a specific scale) in exchange for financing.[15]

Special Case of One Firm and One Social Investor

We first build an intuition for the general case by analyzing a special case with one firm and one social investor (in addition to the commercial market, which provides capital at cost r^C and the outside option asset into which the social investor can invest their capital at return r^C). In the absence of the social investor, the firm would operate at scale k^C solving $\pi'\left(k^C\right) = r^C$, and produce $\pi\left(k\right)$ profits and $w\left(k\right)$ social value. For simplicity, we assume $k^C > 1$.

[14] As in the model of Section 2, we allow social investors to offer more than one contract.

[15] In principle one could study a broader contracting space. For instance, a firm's cost of capital could be made contingent on its social impact. We leave study of the optimal contract design to future work.

We first consider the case where the social investor is values-aligned. This investor will offer the contract $\langle 1, r^C, \emptyset \rangle$ to the firm, which specifies the transfer of 1 unit of capital at cost r^C and with no minimum scale contingency. The firm will then accept this contract and raise $k^C - 1$ capital on the commercial market. To see that this is optimal from the social investor's perspective, note that offering the firm less capital would be dominated, as the investor cannot earn a higher return through the outside option asset and investing in the firm allows the investor to enjoy the firm's social value. Moreover, the investor does not prefer to offer a minimum-scale contingency, because inducing the firm to increase its scale would reduce its average impact per dollar, by the concavity of $w(\cdot)$. Therefore, the values-aligned social investor has no impact on aggregate social value created.

Next consider the case where the social investor is impact-aligned. This investor recognizes that offering capital to the firm without a minimum-scale contingency would not change the firm's scale, or total social value relative to if it were commercially financed. In contrast, offering a contract with a minimum-scale contingency allows the social investor to influence the firm's scale. To identify the optimal contract $\langle c^S, r^S, k^S \rangle$, which specifies the transfer of $c^S \leq 1$ capital at cost $r^S c^S$ and with minimum-scale contingency k^S, we first determine the highest r^S that the firm would accept given the other elements of this contract. If the firm were to reject the contract they would receive a payoff of $q^C \equiv \pi\left(k^C\right) - r^C k^C$, so the highest acceptable r^S solves

$$\pi\left(k^S\right) - c^S r^S - \left(k^S - c^S\right) r^C = q^C \tag{8}$$

The left hand side of the above equality is the firm's payoff if it accepts the contract: its profits at k^S minus the return it pays to its social investor times the amount of capital it receives from them, minus the return it pays to for commercial capital times the amount of commercial capital it must raise to meet the minimum scale contingency.

The social investor then chooses $\langle c^S, r^S, k^S \rangle$ to maximize their own return plus total social

value created:

$$\max_{c^S, r^S, k^S} r^S c^S + \left(1 - c^S\right) r^C + \theta w\left(k^S\right)$$

such that

$$r^S \geq 0, \quad c^S \leq 1, \text{ and, } \quad \pi\left(k^S\right) - c^S r^S - \left(k^S - c^S\right) r^C \geq q^C$$

The three constraints represent the feasibility constraint on the investment return, the investor's capital constraint, and the firm's incentive compatibility constraint.

Solving equation (8) for r^S, substituting this into the maximand yields

$$\max_{k^S} \pi\left(k^S\right) - k^S r^C + \theta w\left(k^S\right)$$

The above objective function is maximized at $\pi'\left(k^*\right) + \theta w'\left(k^*\right) = r^C$. Noting that equation (8) implicitly defines $k^S\left(c^S, r^S\right)$ as a decreasing function of both arguments, so long as $k^S > k^C$, we see that the solution to the investor's optimization problem is either to offer the contract $\langle 1, 0, k^S(1,0)\rangle$ if $k^S(1,0) \leq k^*$, or to offer the contract $\langle c\left(0, k^*\right), 0, k^*\rangle$, where $c\left(r^S, k^S\right)$ is the capital invested, implicitly defined as a function of the return and minimum scale contingency by equation (8). That is, either the social investor invests all of their capital in the firm and induces it to scale as large as possible via the minimum scale contingency, or, if feasible, the investor induces the firm to scale to the point at which the marginal profit plus marginal social impact is equalized with the commercial rate of return, and then invests the rest of their capital in the commercial market.

Before turning to the more general model, we make several observations. First, as $\theta \to \infty$ the impact aligned social investor's objective coincides with the social planner, and hence they implement the social planner's solution. Second, note that in general $k^S(1,0)$ may be more than $1 + k^C$. That is, the social investor may induce the firm to expand by more than the additional capital that they invest, by also providing an additional subsidy – in the form of further concessions in their demanded return – in order to attract additional commercial

investment. Finally, similar to the baseline case, the impact-aligned investor creates more social value than the values-aligned investor by avoiding the displacement of commercial investors. The key difference is that in the continuous production function case, the impact-aligned investor does invest in commercially viable firms, but avoids displacement through the use of minimum-scale contingencies. We enrich each of these observations, and show the robustness of our main results from the baseline model, in the following section.

Equilibrium Structure With Many Firms and Investors

For simplicity we focus separately on the cases where all social investors are values-aligned and where all social investors are impact-aligned.

Values-Aligned Social Investors

The equilibrium when social investors are values-aligned works in much the same way as the binary-project case. Among all firms that receive financing, equilibrium sorting is such that there is a cutoff $\bar{w}$ for which social investors finance all firms with average social value $w_i\left(\bar{k}_i\right)/\bar{k}_i > \bar{w}$, and commercial investors finance the rest. Firms financed by the commercial market have a cost of capital r^C, and firms i and j financed by social investors have a cost of capital pinned down by the following indifference condition among social investors

$$r_i + \theta\frac{w_i\left(\bar{k}_i\right)}{\bar{k}_i} = r_j + \theta\frac{w_j\left(\bar{k}_j\right)}{\bar{k}_j}. \tag{9}$$

which implies that firms with higher average social value have lower costs of capital.

Firms choose their scale in one of two ways. Firms that are unconstrained by a minimum-scale contingency choose their scale $\bar{k}_i$ to maximize $\pi_i(k) - r_i k$, so that $\bar{k}_i$ solves

$$\pi_i'\left(\bar{k}_i\right) = r_i. \tag{10}$$

Firms that are constrained by a minimum-scale contingency need not set their marginal profit equal to their cost of capital. Specifically, let a firm's commercial scale k_i^C solve $\pi_i'\left(k_i^C\right) = r^C$, and define its commercial share of profits to be $q_i^C \equiv \pi_i\left(k_i^C\right) - r^C k_i^C$. A firm constrained by a minimum-scale contingency $\bar{k}_i$ need only satisfy

$$\pi_i\left(\bar{k}_i\right) - r_i \bar{k}_i \geq q_i^C \tag{11}$$

Equilibrium is determined by a set of costs of financing $\{r_i\}$ that satisfies Equation 9, and a set of firm scales $\left\{\bar{k}_i\right\}$ each of which either satisfies Equation 10 or 11. We note that there exists an equilibrium where no investor utilizes scale-contingencies, and Equation 10 determines the scale of all firms.

Finally, we note that across all equilibria, there is no co-investment between commercial investors and social investors within any firm that receives a subsidy relative to the commercial cost of capital.

Lemma 4. *Firms that receive a cost of capital $r_i < r^C$ from any values-aligned social investor are financed wholly by values-aligned social investors.*

Social and commercial investors disagree on the relative value of companies with the same profits but different contributions to social value, so there is no equilibrium price at which both sets of investors would be happy to finance the same investment.[16] While this extreme separation would not arise in a model with, for example, diversification motives, it illustrates an important point. Disagreement about the value of a company among investors implies that to change the scale of the company requires displacing some of its existing investors. This idea is closely related to the observations of Heinkel et al. (2001) and Broccardo et al. (2020), that commercial investors will partially "undo" the actions of social investors, insofar

[16]The one exception is the firm for which $\frac{w_i\left(\bar{k}_i\right)}{\bar{k}_i} = \bar{w}$. This firm may be financed by both commercial and social investors at cost of capital r^C.

as social investors may partially crowd out commercial investors in the firms they finance. We will see in the following section that impact-aligned social investors do not displace commercial investors, and co-investment does occur in equilibrium.

Impact-Aligned Social Investors

Next we analyze how the allocation of capital differs when social investors are impact-aligned. As there are multiple equilibria, in this section we focus on the investor-optimal equilibrium. Our intention in analyzing this equilibrium in particular is not to make sharp predictions about investor behavior, but rather to highlight some of the key differences in investor behavior that may emerge when investors are impact-aligned. The propositions in Section A.2 hold across all equilibria.

We first observe that unlike in the case of values-aligned social investors, impact-aligned social investors do co-invest with commercial investors.

Lemma 5. *In the investor-optimal equilibrium when social investors are impact-aligned, all firms raise at least k_i^C capital from commercial investors.*

If an impact-aligned social investor were to marginally undercut a commercial investor, they would earn a return of r^C, and create 0 additional social value. Therefore, the most efficient way to create impact is to leverage commercial capital, rather than displacing it. Firms that receive social investment raise at least k_i^C capital from commercial markets, and the remaining capital from social investors. In fact, as we demonstrate in the proof of Lemma 5, and analogous to the single-investor case above, in equilibrium firms financed by social investors may raise more than k_i^C commercial capital. In such settings impact-aligned social investors subsidize the entry of commercial investors to increase the scale of firms with high marginal social value.

As in the case with binary projects, because impact-aligned social investors care about total social value creation rather than the social value of the firm they finance, they do not

compete with one another or with commercial investors. Rather than being determined by competitive forces, equilibrium prices of capital are determined by a no-rents condition.

Lemma 6. *Across all equilibria when social investors are impact-aligned, all entrepreneurs earn a payoff of* q_i^C.

Impact-aligned social investors demand a return r_i^S that solves $\pi_i\left(\bar{k}_i\right) - r^C \bar{k}_i^C - r_i\left(\bar{k}_i - \bar{k}_i^C\right) = q_i^C$, where $\bar{k}_i^C$ is the amount of commercial capital raised by firm i in equilibrium. If social investors demanded a higher return, firm owners would prefer to invest at their commercial scale k_i^C and to rely exclusively on commercial capital. And because impact-aligned social investors recognize that by undercutting one another they are not contributing to total social value creation, required returns are set so as to make entrepreneurs indifferent between accepting social capital versus relying exclusively on commercial financing.

We now turn to characterizing the use of minimum-scale contingencies.

Lemma 7. *Impact-aligned social investors utilize minimum-scale contingencies in equilibrium.*

Because impact-aligned social investors set prices so as to leave entrepreneurs with their commercial payoff, the firms they finance are always faced with a marginal cost of capital that is above their marginal return on investment at $\bar{k}_i$. If they were free to choose their own scale, they would accept the subsidized social capital in lieu of commercial capital, and still choose a smaller scale than social investors desired. Therefore, unlike in the case with values-aligned investors, impact-aligned social investors always utilize scale-contingent contracts.

Finally, we turn to equilibrium capital allocation.

Lemma 8. *In the investor optimal equilibrium when social investors are impact-aligned, for any two firms* i *and* j *that receive capital from social investors, we have*

$$\pi_i'\left(\bar{k}_i\right) + \theta w_i'\left(\bar{k}_i\right) = \pi_j'\left(\bar{k}_j\right) + \theta w_j'\left(\bar{k}_j\right). \tag{12}$$

Impact-aligned social investors allocate their capital so as to equalize the marginal profits plus the marginal social value of all firms that receive a subsidy.

Results

In this section we demonstrate that natural analogues of Propositions 2 and 3 extend to this setting. Namely, we demonstrate that in equilibrium values-aligned investors leave both money and impact on the table, and that increasing a firm's profitability may also increase its enterprise impact.

Proposition 7. *In equilibrium there may exist a deviation for a values-aligned social investor that would result in higher financial return and increase total welfare.*

When there is an intensive margin of scale, values-aligned investors still crowd out commercial capital to finance firms with high social value. Even if doing so increases the scale at which the firm operates and thus increases the social value it creates, competition among social investors means that this involves a financial concession. Again, following the same logic as Proposition 2, investors can increase their return and impact by instead supplying their capital to the firm that can most efficiently generate impact on the margin for a given financial concession.

Proposition 7 is stated as a possibility result, rather than generically as in Section 3, because when firms have an intensive margin of scale there is no natural analogue of the sufficient density assumption about the distribution of firms that was employed in Proposition 2. Therefore, even though values-aligned investors make a financial concession that does not contribute to social value, there is no guarantee that there exists a firm to which they can unilaterally deviate to both increase their financial return and total social welfare.

Next we consider an analogue to Proposition 3. We extend the definition of enterprise impact to account for the possibility that firm i attracts capital from more than one type of investor. We define the enterprise impact of firm i to be $e_i(k) \equiv w_i(k) - \nu_i k$, where ν_i

is now the *average* social value of capital utilized by entrepreneur i. We have the following result.

Proposition 8. *Suppose firm i attracts financing from an impact-aligned social investor in equilibrium. Increasing its profitability while holding fixed its social value $w_i(\cdot)$ increases its enterprise impact e_i and total social value created in equilibrium.*

The logic of this proposition is exactly parallel to that of Proposition 3. Take any entrepreneur financed by impact-aligned social investors in equilibrium. As it becomes more profitable, commercial investors will finance a larger fraction of its output, which frees impact-aligned social capital to invest elsewhere and increase total social value.

A.3 Entrepreneurs Make Take-it-or-Leave-it Offers

In this section we allow the entrepreneurs to make take it or leave it offers, rather than the investors. In doing so, we demonstrate that our results do not hinge on impact-aligned investors extracting the full rents from entrepreneurs they finance.

The model proceeds exactly as specified in Section 2 until the subsection labeled "Timing of Actions." Here the only change is that in the *offer stage*, it is the entrepreneurs who offer contracts to the social investors. Next, in the *acceptance stage,* investors choose at most one contract to accept. After this point, entrepreneurs without an accepted contract may take a contract for commercial financing at rate r^C so long as it is feasible ($\pi_i \geq r^C$). Finally, payoffs are realized.

Model Analysis

The analysis of the case where all social investors are values-aligned is virtually unchanged. The incentive compatibility condition governing accepted contracts is still given by Equation 3. Therefore, Lemmas 1 and 2 still hold and equilibrium sorting is unchanged.

The analysis for the case where all social investors are impact-aligned differs from the baseline case in two important ways. First, impact-aligned social investors and entrepreneurs now engage in positive assortative matching, just like in the values-aligned case. In fact, as in the values-aligned case (but unlike in the impact-aligned case of the baseline model) the incentive compatibility condition is Inequality 3. In the baseline case, this incentive compatibility condition did not hold as an impact-aligned social investor recognized that undercutting another investor would not contribute to total social value creation. Therefore, the value to social investor i of undercutting another social investor j was at most r_j, rather than $r_j + \theta_i w_j$. When instead it is the entrepreneurs making offers, if in a candidate equilibrium incentive compatibility condition 3 did not hold for some entrepreneurs i and j with $r_j < r^C$, then entrepreneur j could deviate and offer $r_j - \varepsilon$ to investor i. For sufficiently small ε, investor i would accept this offer because they would recognize that entrepreneur j would not be financed otherwise, so the payoff to accepting the contract is indeed $r_j - \varepsilon + \theta_i w_j$, which is greater than $r_i + \theta_i w_i$ by assumption.

Not only does this imply positive assortative matching in equilibrium (Lemma 1), but Lemma 2 continues to hold as well, which brings us to the second important difference of the analysis. In the baseline model where investors made offers, they were able to extract the full profit from any firm with $\pi_i \leq r^C$, as there was no incentive for any other social investor to undercut them. Given that Lemma 2 holds in the case where entrepreneurs make offers, they retain some of their profits in equilibrium even for entrepreneurs with $\pi_i \leq r^C$. That is, impact-aligned social investors cannot extract the full rents from the firms they finance.

Other than these two differences the rest of the analysis for the case of impact-aligned social investors is unchanged. Critically, under Assumption 1, Lemma 3 still holds and impact-aligned social investors do not finance any entrepreneurs with $\pi_i \geq r^C$.

It remains to show that Propositions 2 and 3 still hold. The logic of Proposition 2 is similar to the baseline case and can be understood with reference to Figure 3. Take any values-aligned investor i financing a firm with profits $\pi_i > r^C$ and consider the firm

highlighted in green. Sufficient density guarantees that there is a firm j in the green region with $r_i < \pi_j < r^C$. In equilibrium that firm is unfinanced, and thus its offer is not pinned down by equilibrium forces. Therefore for any allocation of capital that can be supported in equilibrium, there is an equilibrium strategy profile in which firm j makes a (rejected) offer to investor i at some price $r_i < r_j \leq \pi_j$. If investor i were to deviate from their equilibrium strategy of accepting the offer of firm i, and instead accept this offer from firm j, they would make a higher financial return, as $r_j > r_i$. And as firm i has profits $\pi_i > r^C$, they would still receive financing under this deviation, so total social welfare would also increase. The critical difference relative to the baseline case is that when the entrepreneur is making the offer, there are now departures from the equilibrium where firm j receives financing, and firm j retains a positive fraction of her profits. This makes clear that Proposition 2 does not rely on the ability of impact-aligned investors to extract the full rents of the firms they finance.

The logic of Proposition 3 is exactly the same as in the baseline case. Therefore we do not discuss it further.

B Equilibrium Characterizations and Proofs

B.1 Equilibrium Characterization of Section 3.1

In this section we describe the strategies that support the equilibrium allocation characterized in Section 3.1. Each entrepreneur i who receives financing from a social investor at cost r_i must receive at least two such offers. If not, the social investor who supports entrepreneur i would be incentivized to deviate and offer financing at cost r^C instead.

Specifically, let the entrepreneur with the lowest social value among all those who receive financing from a social investor be denoted $\bar{i}$. The investor assigned to finance entrepreneur $\bar{i}$ makes an offer to all entrepreneurs at their assigned cost of capital r_i. All other investors

make just one offer to their assigned entrepreneur. To see that a social investor has no incentive to deviate from their offer of r_i, first consider the social investors who each make one offer. For each of them, note that by construction, $r^C + \theta_i \bar{w} \leq r_i + \theta_i w_i$. A direct implication is that $r^C + \theta_i w_i < 2\left(r_i + \theta_i w_i\right)$ which is the incentive compatibility constraint for the social investor of entrepreneur i when i receives two offers.

Now consider the investor who finances entrepreneur $\bar{i}$. This investor has no incentive to deviate as any of her contracts, if accepted, would offer her weakly less utility. As in equilibrium her only offer to be accepted is that of entrepreneur $\bar{i}$, she has no incentive to deviate by offering a cheaper cost of capital to another entrepreneur.

B.2 Equilibrium Characterization of Section 3.2

In this section we characterize the welfare- and investor-optimal equilibrium; the equilibrium that maximizes the sum of social value and maximizes the sum of investor utilities.

Define $\sigma(i)$ to be any ordering over all impact-aligned social investors $i \in S$.

At step 1, social investor $\sigma^{-1}(1)$ is called to support an entrepreneur. If she chooses an entrepreneur i with profits $\pi_i \geq r^C$, or the outside option asset, assign her a price of $r_i = r^C$, and a social value of $w_i' = 0$. Else assign her a price of $r_i = \pi_i$ and a social value of $w_i' = w_i$. Social investor $\sigma^{-1}(1)$ chooses the entrepreneur i that maximizes $r_i + \theta_{\sigma^{-1}(1)} w_i'$.

At step k, social investor $\sigma^{-1}(k)$ is called on to support an entrepreneur. She chooses an entrepreneur to support according to the same process, excluding any entrepreneur that has been chosen in a previous step.

This allocation of capital can be supported in equilibrium by the following strategies: every investor offers a single contract to their assigned entrepreneur, at cost $r_i = \min(\pi_i, r^c)$.

Now, assign every social investor an index that is increasing in their altruism parameter θ_i, so that the least altruistic social investors have the lowest indices. Then the welfare- and investor-optimal equilibrium depicted in Figure 2 corresponds to the ordering $\sigma(i) = i$. First

we will demonstrate that the equilibrium arising from any other ordering σ' that results in a different allocation produces lower social welfare than σ.

Take some σ'. Identify two social investors, j and k such that $\theta_j > \theta_k$ and $\sigma'(k) = \sigma'(j) + 1$. That is, j is more altruistic than k, but j chooses an investment one step before k in the ordering σ'. If no such pair can be found then $\sigma' = \sigma$. Now consider an alternative ordering σ'', which is the same as σ' except that $\sigma''(j) = \sigma'(k)$ and $\sigma''(k) = \sigma'(j)$ (i.e. j and k are reordered but everything else is preserved). Let a denote the entrepreneur chosen by k under σ' and b denote the entrepreneur chosen by j under σ'. If in the ordering σ'', k chooses a at step $\sigma''(k)$, then the two orderings result in the exact same allocation. Else, under the ordering σ'', at step $\sigma''(k)$, k chooses b. At step $\sigma''(j)$ under the ordering σ'', j chooses an entrepreneur c such that $w_c \geq w_a$, as j is more altruistic than k. In this case, it is straight forward to show that σ'' results in an allocation with weakly higher welfare than does σ'.

Now take σ'' and repeat the above process (i.e. identify mis-ordered pairs of investors and re-order them). Continue to do so until σ'' results in the same allocation as σ. So long as the allocation arising from σ' and from σ are different, it is straightforward to show that at least one transformation resulted in a strict welfare improvement. Therefore σ induces the welfare-optimal equilibrium.

To see that σ also induces the investor-optimal equilibrium, we need only demonstrate that the shift from σ' to σ'' described above also weakly improves aggregate investor welfare. If in σ'' k chooses a then the allocation and aggregate investor welfare are the same in σ' and σ'' . Otherwise, k chooses b. This improves k's welfare by revealed preference. If in σ'' j then chooses a, then aggregate investor welfare is unchanged from σ' to σ''.

The remaining case is that under σ'', k chooses b, and j chooses $c \neq a$ with $w_c \geq w_a$ and $\pi_c \leq \pi_a$. We complete the proof by demonstrating that this results in higher aggregate investor welfare than the case where j chose a under σ''. Relative to if j had chosen a under σ'', j's welfare is higher by revealed preference. And all investors who chose before j also have

weakly higher welfare, because $w_c \geq w_a$. It remains to show that this also weakly improves the welfare of investors who choose after j under σ''. Relative to the case where j had chosen a, the set of entrepreneurs that these investors can choose from is fixed, except that now c is guaranteed financing, and a remains eligible for financing. Because c has higher social value and lower profits, this can only improve the aggregate welfare of the remaining investors.

Finally, to see that prices are not uniquely pinned down across equilibria, we construct an alternative equilibrium. Consider the following example with two investors and two entrepreneurs. $r^C = 2$, $\theta_1 = \theta_2 = 1$, $w_1 = 10$, $\pi_1 = 1$, $w_2 = 10$, $\pi_2 = 0.5$. Social investor 1 makes one offer to entrepreneur 1 at price $r_1 = 0.5$. Social investor 2 makes an offer to each entrepreneur at $r_1 = r_2 = 0.5$. Entrepreneur 1 accepts investor 1's offer, and entrepreneur 2 accepts investor 2's offer. It is straightforward to verify that no party has a payoff-increasing deviation.

B.3 Omitted Proofs From Sections 3.4, 3.5, 4, A.1 and A.2

Proof of Proposition 2

First, we provide a formal definition of "sufficient density" referenced in Proposition 2. We say that the distribution of firms is *ε-dense* if for every $\pi \in [0, \hat{\pi}]$ and for every $w \in [-\hat{w}, \hat{w}]$, there is a firm i with $|\pi_i - \pi| + |w_i - w| < \varepsilon$. Proposition 2 is formally stated as follows: *Consider any values-aligned social investor i that supports a firm with $\pi_i > r^C$ and earns a return $r_i < r^C$ in equilibrium. There exists an $\varepsilon > 0$ such that if the distribution of firms is ε-dense, there exists an unfinanced firm j with profits $\pi_j > r_i$, such that if the values-aligned social investor i were to deviate and offer firm j financing at cost π_j, total social welfare would increase as would investor i's financial return.*

We sketch the proof of Proposition 2 with reference to Figure 3, where a values-aligned investor in the blue region is moved to instead support an entrepreneur in the green region. For any level of financial compromise that a values-aligned social investor makes to support

a firm that could have attracted commercial financing, ε-density guarantees that there exists a firm that is not supported by any investor but that could offer a higher return than the values-aligned social investor is earning, and such that if the values-aligned social investor were to reallocate her capital to the new firm total social welfare would increase. This new firm has lower w_i than the one that the values-aligned social investor supported, but the values-aligned social investor's contribution to social welfare is higher when supporting the new firm because it could not attract commercial financing.

Proof of Proposition 3

This is a straightforward implication of the equilibrium depicted in Figure 3. Fix any entrepreneur i who is being supported by an impact-aligned social investor. Raising his profit π_i to $\pi_j < r^C$ does not change the type of capital he attracts. But raising his profit to $\pi_j > r^C$ causes him to instead be supported by a commercial investor and his enterprise impact increases. Social welfare increases because the impact-aligned social investor can now support another entrepreneur.

Proof of Proposition 4

Suppose in equilibrium there was some firm i with (π_i, w_i), such that $\pi_i \leq \bar{\pi}(w_i)$, and where firm i does not receive a financing offer from an impact-aligned investor. Then by the definition of $\bar{u}^S$, there must be at least one impact-aligned social investor who either finances some firm j with $\pi_j > \bar{\pi}(w_j)$, or who invests in the outside option asset. In either case, this investor has a profitable deviation of offering firm i a contract with $r_i = 0$. In the former case, this would increase the investor's utility by $\theta(w_i\pi_i - w_j\pi_j)$, and in the latter case it would increase by $\theta w_i \pi_i - r^C$.

Therefore all firms for which $\pi_i \leq \bar{\pi}(w_i)$ receive financing from impact-aligned investors in equilibrium.

Proof of Propositions 5 and 6

We begin with the case of values-aligned investors. We first observe, as depicted in Figure 1, that in equilibrium there is a frontier of firms such that everything "up and to the right" of the frontier is financed by a social investor. Formally, Inequality 3 implies that for any firm i financed by a social investor, and any firm j with $\pi_j \geq \pi_i$ and $w_j \geq w_i$ with at least one of these inequalities being strict, then j is also financed by a social investor.

Converting a commercial investor to a social investor then pushes this frontier outwards, causing one additional firm to be financed by a social investor. Denote this firm, newly financed by a social investor, by s'. We denote by $r^C(c,s)$ and $r_i(c,s)$ respectively the equilibrium commercial cost of capital, and the equilibrium cost of capital for firm i in the market without a converted investor. And denote by $r^C(c-1,s+1)$, and $r_i(c-1,s+1)$ the same objects in the market with a converted investor.

We divide our analysis into two cases.

Case 1: In the equilibrium of the model without a converted social investor, s' is financed by a commercial investor.

In this case $r^C(c-1,s+1) = r^C(c,s)$, as the optimization problem (5) has the same solution (relative to the market prior to the conversion, in the market with the converted investor there is one fewer commercial investor but also one of the firms above $r^C(c,s)$ is now socially financed and hence would no longer accept $r^C(c,s)$).

We also have $r_i(c-1,s+1) \leq r_i(c,s)$. To see this, note that in the converted market, the cost of capital for any socially financed firm i is determined by $r^C(c,s) + \theta w_{s'} \leq r_i(c-1,s+1) + \theta w_i$ with equality so long as $r_i(c-1,s+1) > 0$. Similarly, in the market prior to conversion, the same firm i's price is set by $r_s(c,s) + \theta w_s \leq r_i(c,s) + \theta w_i$, with equality so long as $r_i(c,s) > 0$, for some firm s with $r_s(c,s) + \theta w_s \geq r^C(c,s) + \theta w_{s'}$.

Case 2: In the equilibrium of the model without a converted social investor, s' is not financed by any investor.

In this case $r^C(c-1, s+1) > r^C(c, s)$. This is immediately inferred from optimization problem(5), as in the converted market there is one fewer commercial investor without correspondingly removing one of the firms previously financed by a commercial investor.

That $r_i(c-1, s+1) < r_i(c, s)$ follows the same logic as in the previous case. In the converted market, the cost of capital for any socially financed firm i is determined by $\pi_{s'} + \theta w_{s'} \leq r_i(c-1, s+1) + \theta w_i$ with equality so long as $r_i(c-1, s+1) > 0$. Similarly, in the market prior to conversion, the same firm i's price is set by $r_s(c, s) + \theta w_s \leq r_i(c, s) + \theta w_i$, with equality so long as $r_i(c, s) > 0$, for some firm s with $r_s(c, s) + \theta w_s \geq \pi_{s'} + \theta w_{s'}$.

Turning to the case of impact-aligned social investors, we note that the analysis of the equilibrium commercial capital follows the exact same logic as in the values-aligned case and hence is note repeated.

Proof that Proposition 2 Holds with Endogenous Commercial Market

That the deviating social investor has a higher financial return follows the exact logic of the baseline case and is not repeated. We focus on the proposition that having a social investor deviate from the blue region to the green region increases social welfare. Denote the deviating investor by i, the firm in blue by i, and the firm in green j. In contrast to the baseline case, when the social investor deviates, this causes a reallocation of commercial capital. Specifically, the firm $c'' = \underset{i \in E^C}{\operatorname{argmin}} \pi_i$ no longer attracts financing from any investor. However, sufficient density ensures that for sufficiently small ε, there exists a firm j with not only $\pi_j > r_i$ (ensuring higher financial returns for investor i), but also $w_j > w_c''$ ensuring an increase in total welfare.

Proof that Proposition 3 Holds with Endogenous Commercial Market

Let r^C be the equilibrium commercial cost of capital. Take a firm i financed by an impact-aligned social investor and raise its profits π_i to the point that $\pi_i > r^C$. At this point, firm i will be financed by a commercial investor, and firm $c'' = \underset{i \in E^C}{\text{argmin}} \pi_i$ (which previously set the commercial cost of capital r^C) will no longer receive commercial financing. To see that social welfare increases, we need only verify that the firm s', newly financed by an impact-aligned social investor has $w_{s'} \geq w_{c''}$. By construction c'' has the highest profits of all firms not financed by commercial investors. Hence, if it is left unfinanced, then all firms s financed by impact-aligned social investors, including s', must have higher social value w_s.

Proof of Lemma 4

In any equilibrium all values-aligned social investors are indifferent between supporting any two firms with average social value exceeding $\bar{w}$. Suppose that for one such firm i, where a social investor j offers a cost of capital $r_i < r^C$ there was co-investment. That is, the firm receives some capital at $r_i < r^C$ and some capital at r^C. Then a social investor supporting another firm could deviate and offer firm i a unit of capital at $r_i' = r_i + \varepsilon < r^C$, thereby displacing one unit of commercial capital that firm i previously accepted. This social investor would have strictly higher utility than social investor j, violating the equilibrium indifference condition.

Proof of Lemmas 5, 6, 7, and 8

We directly construct the investor-optimal equilibrium. Let $\bar{k}_i$ be the equilibrium scale of firm i, representing the total social capital it is offered in equilibrium plus $\bar{k}_i^C$, which represents the amount of commercial capital firm i raises in equilibrium. Each social investor

who offers firm i a contract specifies the minimum-scale contingency $\bar{k}_i$, and the required return r_i^S solving $\pi_i\left(\bar{k}_i\right) - r^C\bar{k}_i^C - r_i^S\left(\bar{k}_i - \bar{k}_i^C\right) = q_i^C$.

There is a unique allocation of capital such that

1. $\pi_i'\left(\bar{k}_i\right) + \theta w_i'\left(\bar{k}_i\right) = \pi_j'\left(\bar{k}_j\right) + \theta w_j'\left(\bar{k}_j\right)$ for all firms i and j that receive social capital
2. $\pi_i'\left(\bar{k}_i\right) + \theta w_i'\left(\bar{k}_i\right) \geq \pi_k'\left(\bar{k}_j\right) + \theta w_k'\left(\bar{k}_j\right)$ for firm i that receives social capital and firm k that does not
3. Either,
   (a) For all firms that receive social capital, $\pi_i'\left(\bar{k}_i\right) + \theta w_i'\left(\bar{k}_i\right) = r^C$, or
   (b) $\pi_i'\left(\bar{k}_i\right) + \theta w_i'\left(\bar{k}_i\right) > r^C$ and $r_i^S = 0$.

Social investors offer $\bar{k}_i - k_i^C$ capital to firm i and charge r_i^S satisfying 1-3 above.

We first verify that this is an equilibrium and second verify that it is the investor-optimal equilibrium.

To see that it is an equilibrium, note that it is incentive compatible for firms to accept all contracts that they are offered, as they earn q_i^C regardless of whether they accept all of their social investment contracts and operate at $\bar{k}_i$ or whether they accept only the commercial capital and operate at k_i^C. To see that this is incentive compatible from the investor's perspective, note that the marginal social return plus the marginal profits are equalized across all firms that receive social investor financing, and higher than all of those that do not. If a social investor were to deviate, she would gain at most the marginal social return plus marginal profits of the firm she deviates to, and lose that corresponding value from the firm she supports in equilibrium. By concavity of the firms' production functions this would lower her payoff. Finally, note that social investors cannot raise their required return r_i^S at the firm they are assigned to as they would violate the firm's incentive compatibility constraint.

Now, to see that this is the investor optimal equilibrium, we note that if, holding the allocation of commercial capital fixed, the capital allocation of social investors across firms was changed, this would by definition reduce the sum of total social investor returns plus total social welfare. Reducing the amount of commercial capital that any firm i raised would weakly reduce social investor welfare, and strictly so if social investors in this equilibrium all strictly prefer their allocation to the outside option asset, as either it would result in firm contraction, or it would need to be replaced by social capital previously allocated to another firm, both of which reduce the sum of investors' welfare by more than r^C by construction. Finally, if $r_i^S = 0$ then increasing the amount of commercial capital held by any firm i is not feasible, as it would result in a social investor earning a negative return. And if $r_i^S > 0$ then by construction we have $\pi_i'\left(\bar{k}_i\right) + \theta w_i'\left(\bar{k}_i\right) = r^C$ for all firms that receive social capital, and therefore raising the level of commercial capital would not increase social investors' welfare.

Proof of Proposition 7

Consider the unique equilibrium of the model with values-aligned investors in which no investor utilizes a scale-contingency. In this setting, each firm supported by a social investor operates at the scale $\bar{k}_i$ such that $\pi_i'\left(\bar{k}_i\right) = r_i$. Now consider the case where there are two firms i and j in equilibrium that are both supported by social investors and for whom $\frac{w_i\left(\bar{k}_i\right)}{\bar{k}_i} > \frac{w_j\left(\bar{k}_j\right)}{\bar{k}_j}$ and $w_i'\left(\bar{k}_i\right) < w_j'\left(\bar{k}_j\right)$. The former inequality implies that the equilibrium cost of capital will be lower for firm i, i.e. $r_i < r_j$, and the latter implies that the marginal social value of expanding firm j is higher than for expanding firm i. Now, consider the an arbitrary social investor who supports firm i, and suppose that this investor were to deviate in the following way. Firm i is offered ε less capital, a scale-contingent contract of $\bar{k}_i - \varepsilon$, and charged $\pi_i\left(\bar{k}\right) - \pi_i\left(\bar{k} - \varepsilon\right)$ less. Firm j is offered ε more capital, a scale contingent contract of $\bar{k}_j + \varepsilon$, and charged $\pi_j\left(\bar{k} + \varepsilon\right) - \pi_j\left(\bar{k}\right)$ more. Both firms would accept these contracts, as they do not change the entrepreneurs' share of the profits. And for sufficiently small ε, the

deviation would result in higher social welfare as $w_i'\left(\bar{k}_i\right) < w_j'\left(\bar{k}_j\right)$, and increased profit for the investor as $r_i < r_j$.

Proof of Proposition 8

Consider the case where social investors are impact-aligned, and in equilibrium each investor has a strict preference to support some firm i rather than investing in the outside option asset. And now take one such firm i that receives social capital. Let $\bar{k}_i$ be its equilibrium scale. Modify firm i's profitability to a new function $\tilde{\pi}$ in the following way.

$$\frac{d}{dk}\tilde{\pi}\left(k\right) = \begin{cases} \max\left\{\frac{d}{dk}\pi\left(k\right), r^C\right\} & \text{if } k \leq \bar{k}_i \\ \frac{d}{dk}\pi\left(k\right) & \text{else} \end{cases}$$

This modification increases the profitability of firm i so that it can attract commercial capital up to its former equilibrium scale $\bar{k}_i$, and holds fixed the marginal profitability of firm i at all higher scales. Impact-aligned social investors now recognize that their investment up to $\bar{k}_i$ in equilibrium has no impact. Thus the full mass of impact-aligned social investors who used to support firm i up to $\bar{k}_i$ are now free to allocate their capital elsewhere (potentially in part by increasing firm i's scale beyond $\bar{k}_i$), increasing social welfare.

B.4 Impact-Aligned Preferences in a Model with A Continuum of Investors and Projects

In this section we discuss the behavior of impact-aligned social investors in a setting with a continuum of investors and projects. In a model with a continuum of projects, social investors cannot influence aggregate social welfare $\int_{\bar{E}} w_j dj$. An intuitive formulation of the utility of impact-aligned social preference – which would not conform with the impact-aligned

behavior in our analysis – would be

$$r_i + \theta \int_{\bar{E}} w_j dj \tag{13}$$

Because a single investor cannot influence aggregate social welfare, social investors with the above preferences would single-mindedly optimize their financial return.[17] Nevertheless, the behavior of impact-aligned investors that we analyze can also persist in a continuum model.

Formally, we model the preferences of impact-aligned social investors as arising from the limit of a sequence of discrete models, each of which has a finite but increasing number of projects n that can be financed. In each of these models we assume that impact-aligned social investors have utility

$$\frac{1}{n}\left(r_i + \theta \sum_{j \in \bar{E}} w_j\right). \tag{14}$$

As the number of projects financed increases, the contribution of investor i to social welfare *as a fraction of total social welfare* vanishes, yet so does the amount that she values her own financial return. These preferences might be understood to represent the fact that an impact-aligned social investor places the same relative value on her own financial return and the welfare of a fixed set of others no matter how large is the set of total financed projects.

In contrast, the social preferences represented by Equation 13 can be understood as arising from the continuous limit of the same set of discrete models, in which social investor preferences are

$$r_i + \frac{1}{n}\theta \sum_{j \in \bar{E}} w_j.$$

This would correspond to the idea that relative to her own financial return, a social investor places less value on the welfare of a fixed set of others, as the set of all financed projects grows.

[17] Indeed, this aligns with Pastor et al. (2020), which considers social investors who have preferences for aggregate social value and concludes that this preference does not influence investor behavior.

C Experiment Details

C.1 Survey Instrument

Page 1: Introduction Information

In this survey, you will be presented with a series of hypothetical investment opportunities, and your task will be to choose your preferred option from a pair of alternatives. Each investment opportunity will be accompanied by information about its financial return, the societal impact of the respective companies, and whether that societal impact depends on your investment decision. By incorporating these aspects into the decision-making process, we can assess the importance individuals place on investing in companies that make positive contributions to society.

This exercise will be repeated 14 times, allowing us to gather a comprehensive dataset reflecting your preferences and values concerning societal benefit in investment selection. To express our gratitude and encourage your thoughtful attention, we will provide part of your compensation based on your response to a randomly selected question.

Proceed to the next page to learn more details about the investment scenarios and review an example. Following that you will be asked to take a quiz to demonstrate your understanding of how the investment scenarios work.

Page 2: Investment Scenarios

In each scenario, you will be asked to decide in which of two companies you would rather make an investment. In both cases the investment will be one share of stock in the company. There are three relevant attributes of each investment opportunity:

Financial return: The stock will provide a one-time specified and guaranteed return to the investor. After this time the stock will make no further payments.

Corporate Charity: At the same time the financial return is paid to shareholders, some companies will also donate a specified amount of money to charity per share of

stock. This represents how beneficial the company is to society (in the real world, this might correspond to a company's treatment of workers, customers, the environment etc.)

Investor required for corporate charity: Some of the companies you will see will only be able to make charitable contributions if you choose to invest in their stock. This represents the ability you have as an investor to influence a company to take socially beneficial actions. Other companies will make a charitable donation regardless of your investment decision. Each investment opportunity will indicate whether the charitable donation of that company depends on your investment or not.

Page 3: Example

	Company A Stock	Company B Stock
Your Financial Return	\$8	\$9
Company's Charitable Donation	\$1	\$4
Donation Requires Your Investment	Yes	No

In this example, if you invest in Company A stock, you will receive a return of \$8. Further, if you invest in Company A, it will donate \$1 to charity. If you do not choose to invest in Company A, it would not make this charitable donation.

If you instead invest in Company B stock, you will receive a return of \$9. Further, Company B will donate \$4 to charity, regardless of your investment decision.

If you chose to invest in Company A, a total of \$5 will be donated to charity. This is because Company A would donated \$1 to charity, and Company B would donate \$4 to charity. If you had chosen to invest in Company B, a total of \$4 would be donated to charity, \$0 from Company A and \$4 from Company B. By choosing to invest in Company A over Company B you were thus responsible for creating an additional \$1 in charitable donations in the scenario.

Page 4: Bonus Payments

	Company A Stock	Company B Stock
Your Financial Return	$8	$9
Company's Charitable Donation	$1	$4
Donation Requires Your Investment	Yes	No

If this scenario is the one randomly selected to be compensated, the survey will make real payments to you and donate to charity as follows. Your total reward for completing the survey (base reward plus bonus reward) is the financial return of your chosen stock. The real-life charitable donation we will make to Feeding America is the same as the total amount donated to charity in the scenario based on your choice of investment.

If you had chosen to invest in Company A, you would receive a total reward payment of $8 and we would donate $5 to Feeding America. If you had chosen Company B, you would receive $9 and the survey would donate $4 to Feeding America.

Page 5

There are two common ways people think about investing in stocks with respect to societal or environmental considerations.

First, people who care about values often choose not to invest in companies that don't match what they believe in. For instance, if someone really cares about the environment, they might avoid putting money in oil companies, preferring solar energy companies instead. They might do this, even if they don't think their choice will directly help the environment. This describes a values investor.

Second, some investors make choices that they think will make a difference in things they care about. For example, such an investor worried about climate change might put their money in a renewable energy company, but only if they believe it will help the world use less fossil fuel. They wouldn't invest if they thought the company wouldn't benefit from their money. This describes an impact-aligned investor.

Think about how you might consider choosing companies to buy stock in and the description of impact and values investors above. Which of the following best describes your investment philosophy with respect to social and environmental considerations.

☐ I would not consider social or environmental factors when investing.

☐ I would consider myself a values investor.

☐ I would consider myself an impact-aligned investor.

Main Questions

In the survey instrument, respondents see the following 14 choice scenarios, in random order, randomly interspersed with three attention check questions.

	Stock A			Stock B		
Question	Return	Charity	Pivotal?	Return	Charity	Pivotal?
1	3.50	1.00	No	3.50	0.50	No
2	3.50	1.00	No	3.50	0.50	Yes
3	4.00	1.00	Yes	4.00	1.50	No
4	4.50	2.00	No	4.50	1.00	Yes
5	4.00	1.00	No	3.50	1.00	Yes
6	3.50	1.50	Yes	4.50	1.50	No
7	3.50	0.50	No	4.00	0.50	No
8	3.50	0.50	No	3.00	1.50	No
9	3.00	1.50	No	3.50	1.00	No
10	4.00	2.00	No	3.50	1.00	Yes
11	3.00	0.50	Yes	3.50	1.00	No
12	3.00	1.00	No	3.50	0.50	Yes
13	4.00	1.00	Yes	3.00	2.00	No
14	4.00	0.50	Yes	3.50	2.00	No

Followup Questions

If participants picked the stock of Company A in questions 2, 4, or 12, or picked the stock of Company B in questions 3, 13, or 14, they received followup questions of the following form:

Recall in the following scenario you chose to purchase Company A stock.

	Company A Stock	Company B Stock
Your Financial Return	\$3.50	\$3.50
Company's Charitable Donation	\$1.00	\$0.50
Donation Requires Your Investment	No	Yes

By picking Company A stock you receive \$3.50 in returns and create \$1.00 in total donations. Note however, if you instead chosen to buy Company B stock, you would have made the same returns AND the charity would have received more total donations (in this case, an extra \$0.50). However, your personal investment would have been in a company that is less generous to charity.

Would you like to switch your decision and purchase **Company B** stock?

Note, if this is the scenario randomly chosen for compensation, your compensation will be based on your updated answer to this question. So switching to company B will increase the donation to charity by \$0.50 and not change your cash bonus reward.