Microenterprises and the Lure of Wage Work: Theory and Evidence from Mexican Export Manufacturing

Michael Koelle*

[This version: October 2016]

PRELIMINARY AND INCOMPLETE: PLEASE DO NOT CITE OR CIRCULATE FURTHER

Abstract

This paper studies whether employment opportunities in the wage sector matter for the performance of small enterprises. Entrepreneurs face a choice how to allocate their own labour, and this allocation is indivisible if ownership and control of small firms cannot be separated. To understand the implications of such an environment for small enterprise survival and growth, I extend a neoclassical model of investment by adding a simple dynamic framework of occupational choice under search frictions. The environment is especially salient in urban labour markets of developing countries, where a large share of workers are self-employed, and frequently switch between self-employment and wage employment. The model can give rise to multiple firm-size equilibria that arise through convexities in the optimal growth path of a firm, and predicts a negative relationship between wage employment opportunities and growth of small firms. I test this mechanism using a large-scale dataset from Mexico. Exploiting exogenous variation in wage employment opportunities across local labour markets brought by changes in Mexican manufacturing exports to its biggest trading partner, the US, I find that small-firm owners reduce their firm size in anticipation of local expansions of export manufacturing industries. I provide supplementary evidence to argue that this reduction is indeed driven by expectations about future occupational choices of firm owners.

Keywords: Occupational choice, search frictions, entrepreneurship,

JEL Codes: J24, J64, L26, O17.

*Address: Department of Economics, University of Oxford, Manor Road Building, Oxford OX1 3UQ, e-mail: *michael.koelle@economics.ox.ac.uk*. Thanks to Simon Quinn, and Margaret Stevens, for encouragement and advice; Orazio Attanasio, Ian Crawford, Marcel Fafchamps, Paolo Falco, Juan Carlos Hallak, Leander Heldring, Clément Imbert, Michael Keane, Peter Neary, Chris Roth, Raúl Sánchez de la Sierra, Daniela Scur, and the members of the Firms and Development Student Research Group at Oxford, for helpful discussions and comments; audiences at the following conferences and seminars: LACEA/LAMES (São Paulo), WPEG (Sheffield), CoDE II (Mannheim), Universidad Javeriana and Fedesarrollo (Bogotá), and multiple seminars at Oxford. I thank Pavel Luengas-Sierra for help with some of the data.

1 Introduction

Small firms, owned and operated by an entrepreneur, unite several economic elements. They are firms, turning capital and labour inputs into output, and as employers provide for an important share of jobs. They are also a source of self-employment for their owners. This is particularly true in developing countries, where a large share of the non-rural workforce are self-employed owners of small enterprises, as Figure 1 shows. Entrepreneurship in developing countries has been in the focus of research and policy in recent years,[1] yet an important puzzle prevails: microenterprises on average do not grow by much, inspite of apparently very high returns to capital.[2]

In this paper, I address the question of whether small firm owner's entrepreneurial choices about their firm's inputs and their occupational choices about their own employment are separable, or whether they have to be understood jointly. I propose a particular mechanism through which a non-separation can arise. Small firm owners face a periodic choice between dedicating their time to managing their firm, and between taking up other job opportunities that pay a wage.[3] Given their size and profits, the benefits of separation of ownership and control (Fama (1980); Diamond (1984)) may not outweigh the transaction costs involved, the market for managerial labour is missing, and as a result the choice between self-employment and wage-employment is a discrete choice. However, entrepreneurs face ex-ante uncertainty about the value of a wage offer, because of search frictions or random wage shocks only known by their distribution. Forward-looking entrepreneurs still know in expectation that in the future, with a certain probability, they will leave self-employment to take up an attractive wage offer. Ex ante, this probability of leaving self-employment effectively discounts the returns to investing into firm-specific assets. Entrepreneurs under-invest into their business relative to a world where entrepreneurial choices are made independently and only depend on the returns to capital.

My paper analyses this mechanism both theoretically and empirically. In the theoretical part I formalise the intuition in a simple but general dynamic model. It takes the perspective of an individual firm owner who is faced with two problems: how much of her present wealth to invest into her firm's stock of asset, and whether to continue in self-employment or take up a wage offer. For each problem, I borrow standard modelling techniques from the

[1] See Blattman, Fiala, and Martinez (2014), Fafchamps and Quinn (2015), and McKenzie (2015) on capital grants experiments to foster high-growth entrepreneurship; Karlan and Valdivia (2011); Karlan, Knight, and Udry (2015) and for a review McKenzie and Woodruff (2014) on business training grants. Relatedly, market-based microfinance policies have been evaluated in six comparable randomised trials summarised in Banerjee, Karlan, and Zinman (2015). Bandiera, Barankay, and Rasul (2011) review and discuss policy experiments with firms more generally.

[2] Experimental evidence suggests monthly returns to capital may be as high as 20 percent in Mexico (McKenzie and Woodruff (2008)), 15 percent in Ghana (Fafchamps, McKenzie, Quinn, and Woodruff (2014)) or 5 percent in Sri Lanka (De Mel, McKenzie, and Woodruff (2008)).

[3] This margin of choice is meaningful: across a range of developing countries as diverse as Mexico, Colombia and Ghana, 20 percent of self-employed men are found in wage employment a year later; see table in the appendix for details.

literature: the neoclassical model of firm investment based on the mechanics of the Ramsey (1928) growth model, and the framework of job search under uncertainty that goes back to Stigler (1962) and Mortensen (1970); where I replace the default option of unemployment with self-employment. The novel aspect is that it combines these two problems and shows how they interact with each other. In the empirical part I test the model for small firms in Mexico. I exploit the variation in how job opportunities in export manufacturing industries are created across local labour markets to identify the effects of wage employment opportunities on capital and labour input choices of small firm owners. I document that the business environment for these firms matches the assumptions of the model, and I study the effects of export manufacturing employment shocks on occupational and entrepreneurial choices of small firm owners. I find evidence that is consistent with the mechanism through which alternative employment opportunities for firm owners reduce growth of small firms.

I formulate a two-period model that captures this environment and how it can affect investment decisions of small firm owners. I nest a standard model of optimal investment under uncertainty (with convex preferences and technology) within a two-sector labour market search model. Self-employed individuals can engage in on-the-job search for a wage job. When a sufficiently attractive job offer arrives, agents will take it and shut down their firm. Effectively, the expectation about the shutdown probability acts as an additional discount factor in the intertemporal asset allocation problem, and serves as the critical transmission channel between occupational and entrepreneurial choices. Three critical assumptions let this non-separation arise. First, there is a discrete choice between being an owner-manager of a small firm, and holding a wage job. Second, capital is specific to the firm and cannot be (fully) liquidated. Third, there is ex-ante uncertainty about occupational choices at the time of investment.

In isolation – when attractive wage employment opportunities are absent – the model collapses to a neoclassical investment model. With the occupational choice channel included, the schedule of optimal investment can be convex, implying the existence of multiple equilibria in optimal firm size. Then, initial asset endowment determines which equilibrium is reached, and a 'poverty trap' arises (see Kraay and McKenzie (2014)). Comparative statics show that entrepreneurs reduce investment into their firm when they rationally expect wage employment to be more attractive, either because of an increase in the offer probability, or because a stochastic improvement in wage offers. This formalises how firm growth and optimal investment of firms can depend on occupational choices of firm owners.

Testing the mechanism requires variation in wage-employment opportunities available to small firm owners that is exogenous to other determinants of the returns to capital. I exploit the differential impact on wage employment opportunities of a trade shock: the boom of Mexican manufacturing exports from 2005-2014 that was interruped by a bust during the US financial crisis of 2008/9, which temporarily destroyed close to half a million manufacturing jobs in Mexico. Small firm owners in Mexico and their exposure to export manufacturing jobs provide an ideal testing ground for my theory. I build a dataset that includes almost one million small firms embedded into more than 40,000 unique local labour market observations

that span the decade from 2005-2014. Using the universe of social security records, I am able to build a quarterly panel of export manufacturing jobs in every municipality in Mexico, which I define as a local labour market.

The key challenge to identification is that export manufacturing employment might be correlated with factors that directly impact the productivity (and hence the returns to capital) of small firms. I isolate variation in employment that is exogenous to conditions of the local economy by interacting national-level variation in exports at the product level with a local labour market's pre-determined exposure to different export industries. I further check in detail whether these isolated export shocks directly affect margins relevant to small firms other than employment opportunities of the firm owner. Finally I exploit the timing of shocks and responses to isolate the occupational choice channel form alternative mechanisms.

I structure my findings into four parts. First, I show that predicted changes in export manufacturing employment at the level of a municipality are a good predictor of actual changes in this variable. This confirms that the variation that I isolate constitutes a significant shock to local labour markets. I also show that it is really the interaction between initial exposure to export industries and the national aggregate volume of exports per industry that matters, not the individual components. Second, I document adjustments in local labour markets to export manufacturing shocks. I report how the shock affects transitions into export manufacturing, but not wages in the sector. This is consistent with a model of search frictions where shocks increase the probability of obtaining offers, but not the value of offers. Third, I find that export shocks in the local municipality increase the propensity of firm owners to leave self-employment. In terms of timing, this finding extends to quarters after an export manufacturing shock, but not before. Fourth, I find that export shocks negatively affect the growth of small firms: firm owners exposed to local labour markets where more new wage employment opportunities are created are less likely to hire new workers, compared to firms in labour markets without these opportunities. Importantly, these effects are present for up to a year *before* export manufacturing employment shocks, but not after these shocks. I also present suggestive complentary evidence from another, more limited, dataset that small firms – whether they employ workers or not – invest less in the presence of an export manufacturing employment shock.

I interpret my findings as evidence that this mechanism is indeed relevant. This has at least two important implications for policy. First, policies aimed at fostering growth of small firms needs to take into account the incentives created for small firm owners by the occupational choice channel, which can be an important mitigating factor for the success of such policies. Second, from a macroeconomic perspective, the non-separation of entrepreneurial and occupational choice can be understood as an automatic employment stabiliser. This is especially applicable in labour markets with large self-employed and informal wage sectors, typically in a developing country. A negative trade shock to formal firms – such as during the U.S. crisis of 2008/09 – can be mitigated by the fact that small firms are employing more informal workers than they would in absence of the occupational choice channel.

1.1 Related literature

This paper contributes to four main strands of literature. First, I contribute to the literature on entrepreneurship, occupational choice, and firm performance (Lucas (1978), Kihlstrom and Laffont (1979), Jovanovic (1982), Hopenhayn (1992), Evans and Jovanovic (1989)). It has established capital constraints, human capital formation, and learning about comparative advantage as determinants of firm performance, and considerd the role of occupational choice at the point of entry and selection into entrepreneurship. I add to this by showing how occupational choice can influence the input choices of incumbent entrepreneurs. While there is recent literature studying how risk-free alternative employment opportunities influence risk taking of entrepreneurs (Vereshchagina and Hopenhayn (2009), Hombert, Schoar, Sraer, and Thesmar (2014), Gottlieb, Townsend, and Xu (2016)), this is to the best of my knowledge the first paper to consider the role of uncertainty embodied by search frictions that entrepreneurs face in the wage labour market for firm performance.[4]

The mechanism that I propose is particularly relevant for developing countries with a large self-employment sector, and therefore the second literature I contribute to concerns the nature labour markets in developing countries (Lewis (1954), Harris and Todaro (1970), Fields (1975), Magnac (1991)), in particular the role of self-employment and the nature of entrepreneurship (Bosch and Maloney (2010), Günther and Launov (2012), Haywood and Falco (2016)). My model nests both the 'competitive' and 'segmented' view of self-employment in developing country labour markets by stressing the importance of periodic evaluations by agents of the employment opportunities available to them and, at the same time, the presence of frictions which govern the appearance of attractive opportunities.

Third, my empirical analysis exploits a shock to the export manufacturing industry in Mexico, and documents its effects on local labour markets. With this I contribute to the literature on the effects of trade shocks on local labour markets. This literature has been mainly concerned with the effects of import competition on developing countries such as, for example, the US (e.g., Autor, Dorn, and Hanson (2013)), Acemoglu, Autor, Dorn, Hanson, and Price (2016)) or Germany (Dauth, Findeisen, and Suedekum (2014)). Less attention has been paid to the other side of the medal: countries where jobs are being created because of offshoring and export-led growth. Notable exceptions are Atkin (2016) and Heath and Mobarak (2015) who show how local factory openings alter the opportunity cost of education in Mexico and Bangladesh, and Costa, Garred, and Pessoa (2016) who analyse the effects of Chinese import competition and commodity demand on local labour markets in Brazil.[5] McCaig and Pavcnik (2014)'s analysis trade-induced labor reallocation in Vietnam, unlike most previous work, pays explicit attention to the role of self-employment in developing country labour

[4] David, Hopenhayn, and Venkateswaran (2016) show that losses in productivity and output can be substantial when firms make input decisions under imperfect information. They infer the level of general uncertainty from the degree to which financial markets can predict actual firm performance.

[5] Also, Dix-Carneiro (2014) analyses overall labour market adjustment to trade shocks in Brazil, and Blattman and Dercon (2016) study occupational choice responses to random allocations of factory jobs in Ethiopia.

markets. Methodologically, my paper joins Adão (2015) in exploiting predicted local trade shocks as identifying variation in an occupational choice model.

Fourth, and most generally, by identifying a mechanism that leads to non-separation of occupational and entrepreneurial choices of small firm owners, I contribute to the strands of literature that uncover non-separation of choices across markets. Such results rely on missing markets because of market failures, in my case the missing market for managerial labour in small firms. Prominent examples of non-separation results appear in development economics for production and consumption of household farms (De Janvry, Fafchamps, and Sadoulet (1991), Benjamin (1992)) or in labour economics for fertility and female labour force participation (Killingsworth and Heckman (1986), Eckstein and Wolpin (1989)). Poverty traps are a particular kind of non-separation between initial wealth and the stable equilibrium that is eventually reached in a dynamic model. Poverty traps in a production economy usually require a deviation from neoclassical assumptions about the production technology (Banerjee and Newman (1993), Piketty (1997), Aghion and Bolton (1997)) or about preferences (Banerjee and Mullainathan (2010)), in addition to missing credit markets. In this paper, I show how poverty traps can arise in a model with neoclassical (convex) technology and preferences, through an endogenous occupational choice mechanism.

2 Conceptual Framework

This framework starts with the idea that owners of small businesses in urban areas have access to an active market for wage jobs. Most of their daily decisions about the business may be on the intensive margin – decisions about buying, selling, and investments. Business owners will periodically consider the extensive margin too – that is, whether to continue or shut down their business. For large firms, exit decisions may be based on alternative uses of capital. In the classical literature on firms (e.g. Evans (1987), Jovanovic (1982)) exit decisions follow a learning story: firms exit the industry when they have observed their performance sufficiently to conclude that capital is not used in the firm more efficiently than in the market. For small owner-managed firms and self-employed workers, however, alternative employment opportunities are perhaps really the binding constraints to firm survival.

There is a crucial difference in how information is revealed in markets for the respective outside options for capital and labour, respectively; from a perspective of individual microentrepreneurs. Financial markets make *anonymous* offers of contracts to the general public, and investors are able to accept such contracts at any point in time. Employers, on the other hand, make job offers only to *specific* applicants. At the pre-contracting stage, workers only know the *distribution* of wage contracts in the market, and learn about the value of a specific contract only when an *personal offer* has been made to them. This is formalised in the canonical partial equilibrium search model (Stigler (1962), Mortensen (1970), McCall (1970)) where workers go around searching for the optimal contract, never knowing precisely at which moment in time an acceptable offer will be made to them. This

uncertainty about the opportunity cost of labour can have crucial implications for how small firm owners conduct their business.

I convey this idea in a simple, but general two-period model. I nest an otherwise standard model of investment behaviour under uncertainty within a simple two-sector labour market search model. Self-employed entrepreneurs can engage in on-the-job search for a wage job.[6] If they do, they face a distribution of wages and only learn about the value of a particular possible wage offer if and when it arrives.[7] Entrepreneurs have to decide about how much to invest into their business before an eventual job offer arrives. The invested capital is specific to the firm and cannot be liquidated. The reservation wage summarises entrepreneurs' optimal own future occupational choice. The two-period model allows for a particularly tractable, closed-form solution of the reservation wage. This allows me to keep the algebra simple and focus on how occupational choice interacts with investment behaviour. The quantile of the wage distribution above the reservation wage determines the endogenous shutdown probability for the firm. Effectively, this acts as an additional discount factor when the forward-looking agent makes her investment decision.

The model is able to generate two key insights. Firstly, it can generate non-concavities in the optimal path of capital even with an underlying neoclassical production and utility function. Multiple stationary firm size equilibria may arise as a result, and the initial capital stock determines which equilibrium is reached. Secondly, an improvement in either the wage offer probality or the offer distribution decreases incentives for accumulating capital. Individuals with better prospects in wage employment will tend towards a smaller capital stock, in anticipation of the possibility that they may shut down the firm – and lose their investment – when an attractive job offer arrives.

2.1 A model of investment under on-the-job-search

There are two periods, and two occupations: self-employment and wage employment. Consider an individual who, in the first period, is self-employed as the owner of a small business. The timing of the model is as following: In period one, the agent owns assets k_1 and earns income $\pi(k_1)$. Still in period one, she has to decide how much to invest into future assets k_2. Credit constraints prevent her from borrowing, but she can invest up to the total of her wealth: $k_2 \leq k_1 + \pi(k_1)$. The only use of future assets is to generate business income in the second period, which is known with certainty. She consumes what she not invests: $c_1 = \pi(k_1) + k_1 - k_2$ and receives utility $u(c_1)$ from consumption. At the start of period

[6] I model search as an exogenous process. Koelle and Quinn (2016) include both a costly search effort choice and capital accumulation into an occupational choice model between self-employment, wage employment, and non-employment. In such a model, agents have to trade off two potential investments: investments into capital to increase future earning capacity in self-employment, and investment into costly search to increase the probability of receiving a job offer.

[7] For simplicity, I do not model uncertainty in business profits. Instead, incomes from self-employment are assumed to be deterministic. This implies that agents know about their entrepreneurial ability, and that there is no market risk to running a business. I relax the latter assumption in the emprirical part.

two, wage offers are drawn from a compound lottery. There is a probability λ that the agent receives a wage offer. This allows for the presence of search frictions. If an offer is made, it is itself drawn from a distribution $F(w)$. This distribution is known to the agent. The agent consumes her wage and earns utility $u(w)$. Otherwise she will remain self-employed and have utility $u(\pi(k_2))$ from consumption of her income. The agent discounts future utility from consumption with discount factor β.

I make the following assumptions on functions and parameters:

(A). ***Assumptions on model primitives***

A1. CONCAVE UTILITY: *The utility function $u(c)$ is three times continuously differentiable, with*

$$u'(c) > 0 \quad u''(c) < 0 \quad u'''(c) > 0.$$

A2. NEOCLASSICAL PRODUCTION FUNCTION: *The production function $\pi(k)$ is twice continuously differentiable and obeys the Inada conditions:*

$$\begin{array}{rclcrcl} \pi(0) & = & 0 & & \lim\limits_{k\to 0}\pi'(k) & = & +\infty \\ \pi'(k) & > & 0 & & \lim\limits_{k\to\infty}\pi'(k) & = & 0 \\ \pi''(k) & < & 0. & & & & \end{array}$$

A3. CUMULATIVE DISTRIBUTION FUNCTION: *The function $F(w;a)$ is a cumulative distribution function of w parameterised by a that admits first order stochastic dominance in a:*

$$\begin{array}{rcl} F(w,a) & = & \displaystyle\int_{-\infty}^{w} f(x,a)dx \\ & \textit{with} & \displaystyle\int_{-\infty}^{+\infty} f(x,a)dx = 1 \\ F_a(w,a) & = & \dfrac{\partial F(w,a)}{\partial a} < 0. \end{array}$$

A4. DISCOUNTING: *The discount factor is $0 < \beta \leq 1$.*

A5. SEARCH FRICTIONS: *A wage offer arrives with probability $0 \leq \lambda \leq 1$.*

The assumption of credit constraints is necessary to make the problem interesting, else all firms would immediately reach their optimal size. The assumption that capital in the second period is not available outside the production function isolates the profit motive for capital accumulation from other mechanisms.[8] Together, the assumptions that capital is specific to production, and that there is a discrete choice between self-employment and

[8]It is possible to extend the model to allow agents to use assets for intertemporally shifting consumption. However, with such an extension, a precautionary savings motive provides an additional mechanism for asset accumulation. By shutting down this possibility, the model focusses on business profits as the rationale for asset accumulation.

wage-employment, embody the principle that ownership and control of small firms cannot be separated. I parameterise the wage distribution in assumption $A3$ so that I can discuss an improvement in the wage distribution by means of comparative statics calculus. The strictly positive discount factor in assumption $A4$ ensures an interior solution.

The value function summarises the decision problem for optimal capital choice:

$$\begin{aligned}
&\max_{k_2 \leq \pi(k_1)+k_1} V(k_1; \lambda, a) \\
&= \max_{k_2 \leq \pi(k_1)+k_1} \Bigg\{ u\left(\pi(k_1) + k_1 - k_2\right) + \\
&\quad \beta \cdot \Big[\lambda \cdot E \max \Big\{ u(w), u(\pi(k_2)) \Big\} + (1-\lambda)\, u(\pi(k_2)) \Big] \Bigg\}
\end{aligned}$$

The E max operator indicates that, from a point of view of the first period, agents anticipate their optimal occupational choices in the second period. Given the well-behaved utility and production functions, there is a unique crossing point z along the wage distribution for every k_2. We can use this insight to re-write the problem as:

$$\begin{aligned}
&\max_{z, k_2 \leq \pi(k_1)+k_1} V(k_1; \lambda, a) \\
&= \max_{z, k_2 \leq \pi(k_1)+k_1} \Bigg\{ u\left(\pi(k_1) + k_1 - k_2\right) + \\
&\quad \beta \cdot \Big[\lambda \cdot \int_z \Big(u(w) - u(\pi(k_2)) \Big) d\, F(w, a) + u(\pi(k_2)) \Big] \Bigg\}
\end{aligned} \tag{1}$$

2.2 Equilibrium

The first order conditions are the necessary conditions for an optimal choice of z and k_2, given the state variable k_1 and parameters:

$$\begin{aligned}
V_1(z, k_2; k_1) &= -\beta\lambda f(z, a) \cdot [u(z) - u(\pi(k_2))] \qquad (2) \\
&= 0;
\end{aligned}$$

$$\begin{aligned}
V_2(z, k_2; k_1) &= -u'(\pi(k_1) + k_1 - k_2) + \qquad (3) \\
&\quad \beta \cdot \left[1 - \lambda \cdot (1 - F(z, a))\right] \cdot u'(\pi(k_2) \cdot \pi'(k_2) \\
&= 0.
\end{aligned}$$

where V_1 denotes the partial derivative with respect to the first argument. We can solve condition (2) for z for an explicit expression of the reservation wage as a function of k_2:

$$z = \pi(k_2) \tag{4}$$

Plugging this into the other first-order condition (3) reduces the problem to a univariate model with k_2 as the unique choice variable:

$$\begin{aligned} V_2(k_2; k_1) &= -u'(\pi(k_1) + k_1 - k_2) + \\ &\quad \beta \cdot \left[1 - \lambda \cdot (1 - F(\pi(k_2), a))\right] \cdot u'(\pi(k_2) \cdot \pi'(k_2) \\ &= 0. \end{aligned} \tag{5}$$

Condition (5) expresses the Euler equation that characterises the condition for an optimal asset allocation across periods. It equates the marginal utility of consumption in period 1 with the discounted, expected marginal utility of consumption in period 2. Since the marginal value of capital in wage-employment is zero, the expected marginal utility of capital is really only the marginal utility in self-employment, times the probability of staying self-employed. Agents discount future marginal utility from investment by the expected probability of shutting down the firm. I refer to

$$\delta(z(k_2)) = \beta \cdot \left[1 - \lambda \cdot (1 - F(\pi(k_2), a))\right] \tag{6}$$

as the *effective discount factor*. When this effective discount factor is equal to β, the Euler equation just describes a basic neoclassical savings-investment model in the tradition of Ramsey (1928). My model reduces to a Ramsey model when $\lambda = 0$ – when the agent never receives a wage offer – or when $F(z, a) = 1$ – when the reservation wage is higher than any wage offered in the market. The effective discount factor reaches its lower bound $\beta \cdot (1 - \lambda)$ when the agent accepts job offers at any wage. Then, $F(z, a) = 0$ and the effective discount factor is determined only by time preferences and the degree of search friction. Somewhat contrary to intuition, occupational choice affects the investment behaviour more if labour markets are more efficient and the self-employed frequently receive job offers, holding the wage distribution constant.

The concavity of the utility function and a strictly positive discount factor ensure that an inner solution of the first order condition is always reached. Further, a second order condition is required to ensure that the first order decision indeed describes a maximum. The second-order, sufficient condition for an optimal investment choice is given by:

$$\begin{aligned} V_{22}(k_2; k_1) &= u''\left(\pi(k_1) + k_1 - k_2\right) + \delta(z(k_2)) \cdot \\ &\quad \left[u''\left(\pi(k_2)\right) \cdot \pi'(k_2) + u'\left(\pi(k_2)\right) \cdot \pi''(k_2)\right] \\ &\quad + \beta\lambda f(\pi(k_2), a) \cdot u'(\pi(k_2)) \cdot \left(\pi'(k_2)\right)^2 \end{aligned} \tag{7}$$

where V_{22} denotes the second derivative of the value function, twice with respect to the second argument. The sign of (7) is ambiguous. The value function is not globally concave. This is not necessary for a solution to exist - we only require the value function to be *locally* concave at an optimum. Therefore, we can appeal to the result that the first and second order conditions are necessary and sufficient to describe a maximum of the value function. That is, at any optimum, the first order condition (5) and the second order condition $V_{22} < 0$ *must* hold.

3 Discussion

In the following I characterise how the equilibrium is affected by changes in the economic environment that an individual decision maker faces. Two comparative statics results are of special interest here. Firstly, I analyse how optimal asset choices k_2 vary with initial capital stock k_1. In analogy to models with many periods, I will refer to this policy function that maps initial into future capital stock as the *law of motion of assets*, and I will refer to points where the optimal policy is $k_2 = k_1$ as *steady state equilibria.* The two-period model is sufficient to capture the intuition about these more general dynamic concepts.

It will show that the policy function of this model can be locally convex, and that there can be multiple, stable steady state equilibria. A key determinant of the shape of the policy function is the location of the wage distribution relative to the profit function. This leads me to, secondly, analyse how optimal asset choices, and by extension the evolution of firm size, are affected by changes to the value of wage employment. In particular, I derive comparative statics with respect to a first order stochastic improvement in the wage offer distribution, and to an increase in the probability that a wage offer is made.

In the final part of the section, I will provide some further intuition for the mechanics of the model. I will pay particular attention to the role of the effective discount factor as the transmission mechnanism between occupational and entrepreneurial choices of small firm owners.

3.1 Schedule of optimal investment

The slope of the policy function $k_2(k_1)$ is characterised by the derivative of the first order condition for optimal investment (5):

$$\frac{dk_2}{dk_1} = \frac{-V_{21}}{V_{22}} = \frac{u''(\pi(k_1) + k_1 - k_2) \cdot (1 + \pi'(k_1))}{V_{22}} > 0. \tag{8}$$

The sign follows from the numerator being negative by concavity of the utility function, and the denominator (7) being negative at an optimum. The slope is everywhere positive.

From the first order condition (5), it is straightforward to verify that a steady state in assets must exist. Since $F(z, a)$ is a cumulative density function it is bounded in the unit interval. By concavity of $\pi(k)$ there always exists a k such that $-1+\beta\cdot[(1-\lambda)+\lambda\cdot F(\pi(k), a)]\cdot\pi'(k) = 0$ if there is a positive probability that the agent stays in her business.[9] However, unlike in the standard neoclassical investment model, this steady state need not be unique because the law of motion of assets may be locally non-concave.

[9] This is the case whenever $\lambda < 1$ or $F(\pi(k), a) > 0$ - that is, there is a chance that there will be no job offers, or that the agent is willing to not accept at least some of the wages on offer. Otherwise, optimal investment will be zero independently of the initial capital stock, because there never is any use for invested capital if the agent leaves self-employment with certainty.

I order to show this, I take the second derivative of the law of motion:

$$\frac{d}{dk_1}\left(\frac{dk_2}{dk_1}\right) = \frac{-V_{211}\cdot V_{22} + V_{21}\cdot V_{221}}{V_{22}^2} \tag{9}$$

$$\begin{aligned} = \quad & \frac{1}{V_{22}^2}\cdot\Bigg\{u'''(\pi(k_1)+k_1-k_2)\cdot(1+\pi'(k_1))^2\cdot \\ & \Bigg[\delta(z(k_2))\cdot\left[u''\left(\pi(k_2)\right)\cdot\pi'(k_2)+u'\left(\pi(k_2)\right)\cdot\pi'''(k_2)\right] \\ & +\beta\lambda\cdot f(\pi(k_2),a)\cdot u'(\pi(k_2))\cdot(\pi'(k_2))^2\Bigg] \\ & +V_{21}\cdot\left[u''(\pi(k_1)+k_1-k_2)\cdot\pi''(k_1)\right]\Bigg\} \end{aligned}$$

The sign of (9) is ambiguous. The summands in the the second and fourth lines are negative, while the third line is positive; the first line is a positive constant multiplied with each of lines 2 and 3. When the expression in the third line dominates, (9) is positive and the optimal capital path is convex, leading to a situation of multiple equilibria. In the appendix, I discuss further under which conditions this is the case.

From condition (9), we can check that the law of motion is always concave (and therefore convergence to a unique steady state is guaranteed) whenever the model reduces to the neoclassical investment model. This is the case if the third line of (9) reduces to zero, which happens under any of the following conditions: if there are no wage offers and $\lambda = 0$; or if the reservation wage does not overlap with wages offered in the market (if it is higher or lower than any market wage) and therefore $f(\pi(k_2), a) = 0$.

3.2 Availablity and attractiveness of wage employment opportunities

Next I describe how optimal investments change with improvement in the wage offer distribution and the probability of receiving an offer, respectively. I model an improvement in the wage distribution as a first order stochastically-dominant shift in the wage distribution by increasing the parameter a (see Assumption $A3$). I obtain the comparative static

$$\frac{dk_2}{da} = -\frac{\beta\lambda\cdot\frac{\partial F(w;a)}{\partial a}|_{w=\pi(k_2)}\cdot u'(\pi(k_2))\pi'(k_2)}{V_{22}} < 0 \tag{10}$$

Since $V_{22} < 0$ at an optimum, the sign of (10) is globally negative. A stochastic improvement in the wage offer distribution reduces investment everywhere.[10] Such a shock to the wage

[10] More precisely, it reduces investment where $\frac{\partial F(w;a)}{\partial a}|_{w=\pi(k_2)} < 0$; so at levels of k_2 where $\pi(k_2)$ overlaps

distribution will act as a shock to the effective discount factor. For a given reservation wage, it is now more likely that a wage offer is accepted. This brings down the optimal investments and in turn the reservation wage, until a new equilibrium is reached.

The same result obtains qualitatively when the offer probablity λ experiences a positive shock, instead of the wage distribution. The comparative static for this case is given by

$$\frac{dk_2}{da} = \frac{\beta \cdot F(\pi(k_2); a) \cdot u'(\pi(k_2))\pi'(k_2)}{V_{22}} < 0 \tag{11}$$

These two results constitute the main testable predictions of the model. A positive shock to wage-employment opportunities for small firm owners endogenously reduces the growth of small firms. This shock can manifest itself in two parameters of the model. On the one hand it can increase the availability of wage offers by shifting λ, the likelihood that an offer is made. On the other hand it can make wage offers more attractive by shifting the wage distribution upwards, here modelled as a first order stochastic improvement in the offer distribution parameterised by a.

Before I proceed to finding an empirical setting that matches the assumptions of my model, and which allows me to carry out an empirical test of these comparative statics, I will offer further intuition into the mechanics of the model. In particular, I will discuss how the effective discount factor acts as a transmission channel between occupational and entrepreneurial choices.

3.3 Effective discount factor as transmission channel

I start the discussion of the intuition of the model and its implications by illustrating the law of motion for two cases. The first case is the neoclassical benchmark model with $\lambda = 0$ (see the discussion around equation (6)), and the second case is my model that includes the occupational choice mechanism in optimal investment decisions, with a positive and large $\lambda = 0.7$. Like all graphical representations of the model in this paper, I construct this graph by computer simulation of a parametric version of the model. I simulate using a Cobb-Douglas production function, a CRRA utility function and a lognormal wage distribution.[11] The upper left-hand panel of figure 2 depicts a unique steady state at C'; the law of motion is globally concave. The upper right-hand graph shows a law of motion which is both concave and convex, and which gives rise to multiple stable steady state equilibria. Stable equilibria are located where the law of motion crosses the 45 degree line and is locally concave at the point of crossing. These points are labelled A and C in the graph. The steady state at point B is unstable: a small perturbation of k_1 causes assets to move away from the steady state.

with the range of the wage distribution $F(w; a)$. In other words, changes in wage opportunities matter only as far as they change the mass of wages above the profits from self-employment. In regions where profits are lower or higher than any wage offered in the market, this condition is not true. Similarly, equation (11) is only true for $F(\pi(k_2), a) > 0$. More wage offers only matter if there is some wage offer that could be acceptable.

[11] Appendix A lists the details of parameter assumption for each figure.

For any level of initial assets above B, firm size will converge to the high capital equilibrium C whereas for entrepreneurs with initial assets below B it will tend towards the low capital equilibrium A.

The effective discount factor (6) relates occupational choices of the firm owner to shutdown probabilities of the business. This becomes evident from the Euler equation (5). The presence of the effective discount factor is what changes the Euler equation with respect to the benchmark neoclassical investment model. When the occupational choice channel is switched on, then the effective discount factor changes as we move up the distribution of initial assets:

$$\frac{\partial \delta(z)}{\partial k_1} = \beta\lambda \cdot f(\pi(k_2), a) \cdot \pi'(k_2) \cdot \frac{\partial k_2}{\partial k_1} \tag{12}$$

Again, only when $f(\pi(k_2), a)$ and λ are positive does a change in initial assets, through a change in future assets and the reservation wage, translate into a movement of the effective discount factor.

This mechanism, with effective discount factors corresponding to the situations from Figures 2a and 2b, respectively, is illustrated in the bottom-left panel of Figure 2. The graph plots the effective discount factor implied by each level capital. When $\lambda = 0$ the schedule of the effective discount factor with respect to capital is flat. With a positive offer probability, and with a wage offer distribution that overlaps with the distribution of self-employment incomes for most levels of capital, the discount factor rises with the level of capital. The intuition behind this is that as capital increases, so do profits from self-employment. This means that with every marginal increase in capital, there are some wage offers that cease to be attractive because they are lower than incomes from self-employment, which equal the reservation wage in this model. The rising effective discount factor incorporates this reduction in the probability that the entrepreneur will stay self-employed.

How does the expectation about occupational choices transmit to investment decisions? Figure 3 illustrates this from a different perspective, by plotting the rate of return against the initial capital stock. The right-hand side of the figure shows the neoclassical benchmark model without the occupational choice channel. Suppose for a moment, as a thought experiment, that $k_2 = k_1$. The black solid line depicts the return to capital at this level, which is purely determined by technology. The blue dashed and dotted line depicts the rate of return which is 'desired' for a steady state of capital (the inverse of the effective discount factor), in the following sense: if the rate of return (RoR) is higher than the blue line, then entrepreneurs increase their capital stock, and $k_2 > k_1$. This region is to the left of point C', and the adjustment process of capital is symbolised by arrows. If the RoR is lower than the 'desired' rate, then entrepreneurs decrease their capital stock ($k_2 < k_1$) to push up the rate of return. If these adjustement processes are repeated, then there is a unique point at C' where entrepreneurs neither wish to increase nor decrease their capital stock. This is what I refer to as a *steady state*.

The figure on the left-hand side of Figure 3 depicts an example of this graph when the occupational choice channel is switched on. Note that technology has not changed, and so

the return of capital (the black solid line) is the same as before. However, the 'desired' rate is now different. At low levels of capital, there are many wage offers that are attractive relative to staying in self-employment, and so the anticipated probability of staying self-employed is low. At high levels of capital (and by extension profits), only few wage offers are attractive enough and the anticipated probability of staying is high. The graph illustrates how both of these situations can be self-sustaining: for all levels of initial capital lower than point B, firms tend towards the steady state at A. Otherwise they tend towards the high-capital high-profit steady state at C.

Figure 3 also illustrates how my model is able to reconcile a situation where small firms do not grow even though returns to capital are high. If high returns to capital arise in firms whose owners also face a high probability of receiving attractive wage offers, then these entrepreneurs may decide to have low levels of investment inspite of the high returns, because they apply heavy discounts to these returns.

Finally in the bottom-right corner of Figure Figure 2, I overlay the optimal capital schedules for the cases where $\lambda = 0$ and where λ is positive. This illustrates the main comparative static that I will test for: small firms reduce their firm size when the probability of receiving an attractive wage offer increases. To this I now proceed.

4 Empirical Strategy

Testing for separation between entrepreneurial and occupational decisions of small firm owners requires variation in wage employment opportunities available to small firm owners. For an empirical counterpart to the comparative static (11), we need to find a situation where wage employment opportunities should influence entrepreneurial decisions only through their effect on the probability entrepreneurs place on leaving self-employment in future periods, and not directly through their effect on future profits made by the firm. Having found such a situation, we can then test whether wage employment opportunities have an effect entrepreneurial and occupational decisions of small firm owners, particularly investments into the growth of their firms, and their decision to stay in business or to leave self-employment.

The approach I take focusses on variation in wage employment opportunities across local labour markets. I consider wage employment opportunities that are in principle available to any worker because they do not require a narrow set of skills. In particular, I exploit changes in employment created by a set of manufacturing industries dominated by blue-collar jobs in large firms that produce for export to international markets.

There are three main concerns for identification with this approach. First and foremost, omitted factors at the level of the local labour market could drive both the growth in export manufacturing firms, and the growth of small firms. Second, there could be a link between export manufacturing and small firms that operates through the direct channel, instead of through the occupational choice channel. For instance, linkages in the product markets or competition in the demand for labour, could directly influence net profits of small firms.

Third, if small firms themselves are export manufacturers, a mechanical reverse causal effect could be at play.

My starting point to circumvent these identification problems is to isolate the variation in export manufacturing employment that occurs because of shocks to foreign demand for goods produced by Mexican export manufacturers. I construct a measure of job creation in the export manufacturing sector in the local labour market that is purely due to the variation in foreign demand for the goods that the local labour markets specialised in during an initial period. In particular, I express predicted job creation in export manufacturing (XME), per thousand people of working-age, in local labour market m, as:

$$\left(\frac{\Delta \widehat{XME}}{WAPop}\right)_{m,t} = \sum_{g \in \{XM\}} \frac{E_{m,0,g}}{WAPop_{m,t-1}} \cdot \frac{\Delta x_{t,g}}{x_{0,g}} \tag{13}$$

whereby I create the predicted number of jobs per industry g as the interaction of initial local employment in this industry $E_{m,0,g}$ with the change of national Mexican exports of goods from this industry between the current period t and the previous period $\frac{\Delta x_{t,g}}{x_{0,g}}$, expressed as an index normalised to initial period exports. I use bilateral exports to the US, by far the biggest export market. This allow me to exploit the negative shocks to exports following the US financial crisis of 2008/09, and the recovery period in subsequent years. I normalise everything by the lagged working-age population (in thousand) and sum up over all export manufacturing industries to create a single job creation figure for a local labour market and period. I usually take a period to be a trimester.

Using predicted instead of actual local job creation provides for variation that is independent of economic forces operating at the local level other than initial exposure to export manufacturing, which can be controlled for. Focussing on a sector dominated by large, internationally integrated firms, I effectively separate the spectrum of firms in two groups: small firms run by entrepreneurs who may have an outside option in local wage employment – the group for whom I expect my model to apply – and large export manufacturers whose choices are influenced only by international demand. However, this strategy is still exposed to the potential problem that effects on small firm growth operate through direct channels, and not through occupational choice.

To address this remaining issue, I begin by noting that the fact that I exploit variation at fairly high frequency – a quarter – should mitigate the influence of direct channels that work through price adjustment in local markets, which take time to play out.[12] Further, we expect some direct channels to influence small firm growth in the opposite direction to wage employment opportunities: while increased job creation should reduce small firm

[12]Shocks to manufacturing industries need not necessarily propagate through equilibrium adjustments at the local market level, but can rather spread through industrial backward and forward linkages. For the US, Acemoglu, Autor, Dorn, Hanson, and Price (2016) find that only 10-15 percent of job losses due to Chinese import competition can be explained by local adjustments. The most important channel are backward (upstream) industrial linkages with suppliers of directly exposed industries.

growth through the occupational choice channel, local demand spillovers should increase it. Finally, I exploit the timing of entrepreneurial decisions and export manufacturing shocks: future export manufacturing shocks should precede local price adjustment, thereby shutting down the indirect channel. But they should influence entrepreneurial decisions through the anticipated occupational choice channel, according to what I posit in the model.

Small firm owners in Mexico and their exposure to export manufacturing jobs provide an ideal testing ground for my theory. I will present this argument in a number of steps. I will start by documenting descriptive evidence that supports the key assumptions of my theory - that there is a discrete choice between self-employment and wage employment, that small firms in general do not survive the exit of their owner from self-employment, and that they cannot finance their investments by borrowing. Then I will show that predicted export manufacturing employment creation is a strong predictor of observed employment creation. Furthermore, I will document the impact of XME shocks at the level of the local labour market. To anticipate results, I will find no evidence for short-term adjustments in export manufacturing wages. Rather, the main response seems to happen through the number of job postings, manifested in worker transitions into wage-employment, in particular into export manufacturing employment. I will then show at the individual level that self-employed workers do take up jobs in export manufacturing when they are created in their local labour market. Armed with this body of evidence suggesting that the business environment for small firms in Mexico indeed corresponds with the setting of my theory, my estimate of the effect of future export manufacturing employment opportunities on small firm growth then provides a test of the main prediction of the model: that small firm growth is negatively affected by shocks to future employment opportunities to small firms owners, implying that their entrepreneurial choices cannot be separated from occupational choices. Using changes in the number of employees of a firm as my main measure of firm growth, I will show the effect of predicted XME changes on changes in firm size. I will further complement this with direct evidence on fixed capital investment for the much smaller subset of firms for which this measure is available.

4.1 Empirical specifications

To analyse the impact of shocks to export manufacturing employment on local labour markets, I regress the predicted quarterly change of predicted export manufacturing employment (XME) as defined in equation (13) on the quarterly change of outcomes at the level of the local labour market, defined by a municipality m:

$$\Delta y_{m,t} = \alpha + \beta \left(\frac{\Delta \widehat{XME}}{WAPop} \right)_{m,t} + \boldsymbol{x'_{m,t}} \beta_{\mathbf{1}} + \Delta \epsilon_{m,t} \tag{14}$$

By specifying the regression model in the first difference, I remove any time-invariant factors at the level of the municipality, which could influence both outcomes and the *level* of export manufacturing employment. I also control for the sources of variation that are used

as inputs in the construction of predicted XME, and which could directly shift trends in outcomes. In the vector $\boldsymbol{x_{m,t}}$ I control for trimester fixed effects to pick up any aggregate time series variation contained in the time series of exports; the initial XME share to capture differential trends by initial condition of the municipality; and state fixed effects to avoid spurious correlation due to different trends in regions where export manufacturing happens to be located. Per default, I always include these three sets of controls; and then may add additional controls discussed later.

I estimate the effects of wage employment opportunities in export manufacturing on individual decisions of small firm owners i using the following regression model:

$$\Delta y_{i,m,t} = \alpha + \beta \left(\frac{\Delta \widehat{XME}}{WAPop} \right)_{m,t+s} + \boldsymbol{x'_{m,t}}\beta_{\mathbf{1}} + \boldsymbol{x'_{i,m,t}}\beta_{\mathbf{2}} + \Delta\epsilon_{i,m,t} \tag{15}$$

where the coefficient of interest is the effect of predicted XME on individual changes in outcomes between period t and $t-1$. I again control separately for the ingredients for the XME prediction. In $\boldsymbol{x_{i,m,t}}$ I include controls for individual demographics, firm characteristics, and size of the locality of residence. I furthermore allow for the possibility of shifting the change in predicted XME by s quarters into the future or the past. This allows for picking up, respectively, anticipation of, and adjustment to, XME shocks.

5 Data

I build a dataset that links individuals from the Mexican working-age population to administrative records covering the universe of formal employment in Mexican local labour markets. In order for my test to have power, I require a large sample covering many different local labour market constellations. Individual data come from 40 trimestral waves of the ENOE labour force survey that span the years 2005 to 2014. The ENOE is collected by the national statistical institute, INEGI, and is targeted to cover around 120,000 households every trimester. The survey has a rotating panel structure, and individuals remain in the survey for 15 months (5 waves) if they remain resident in the same dwelling.

In all of my analysis, I restrict the sample to the working-age population aged 15 to 64. Over the 2005-2014 decade I obtain more than 10 milllion individual observations. I pay particular attention to the trajectories of individuals that are initially self-employed with a non-agricultural business with a maximum of 20 employees. I retain around 928,000 spells that run over two quarters, and where individuals start in self-employment in the first of the two periods. Information in the ENOE encompasses the kind of variables typically found in labour force surveys, including sociodemographics, employment information, and income. A smaller subset of the self-employed small firm owners surveyed for the ENOE underwent an additional, cross-sectional enterprise module called ENAMIN, carried out in the fourth trimester of 2008, 2010 and 2012, respectively.[13] From the ENAMIN I obtain information

[13]The ENAMIN module is only administered to firms with a maximum of 10 workers (15 if in the manu-

on capital and investment for around 54,500 small firms.

The local labour markets I consider in this analysis are defined by municipalities. At the time of the 2005 Census, Mexico was divided into 2,454 municipalities, and I use these municipality boundaries throughout. I identify municipalities by the unique identifier assigned by INEGI, and merge different data sources by municipality. With this, I am able to capture variation in 41,484 unique local labour market constellations across space (municipalities) and time (trimesters) that each overlap with at least one observation from the ENOE.

Social security records come from IMSS, a government institution tasked both with administering the public social insurance scheme, and with providing services, in particular healthcare and pensions. Enrolment with IMSS is mandatory for all workers, thus by definition the set of all IMSS-affiliated workers is equivalent to the universe of formal employment in Mexico. From disaggregated end-of-month records provided by IMSS, I construct a dataset containing the average number of IMSS affiliates in each trimester, for each municipality and industry, identified by 3-digit NAICS codes.[14] I exlude the Federal District of Mexico City (D.F.) from my analysis because I am not able to map IMSS records to municipality-level sub-units of the D.F.

For the construction of predicted export manufacturing employment per thousand working age population, I obtain monthly time series of Mexican exports to the US at the level of 3-digit NAICS industries from the US Census Bureau. To construct the working-age population for each municipality and quarter, I combine population counts from the 2005 and 2010 Census, and official population predictions 2010-2050 from CONAPO, the National Population Council. My measure of working-age population is hence based on a model of long-term population trends, and not exposed to short-term fluctuations.

5.1 Mexican export manufacturing

Mexico has seen a boom in export-oriented industrialisation in recent decades, in particular since the creation of NAFTA, the free-trade zone between Mexico, the US, and Canada, in 1994. Sharing a 2000 mile land border with the largest economy in the world unsurprisingly implies that the lion's share of Mexican exports (more than 80 percent) goes to the US. While the initial phases of export manufacturing were characterised by a prevalence of low-skilled jobs, many of whom were held by young women (Atkin (2016)), by 2005 employment in this sector was roughly equally distributed between industries in the garment trade with tasks on the lower end of the skill spectrum, and high-skill intensive industries in electrical and machinery manufacturing, including automotive.[15]

facturing sector). This definition designates the firms run by 99 percent of self-employed ENOE workers for inclusion into the ENAMIN.

[14] IMSS maintain their own system of geographical and industry classification. I match IMSS sectors to 3-digit NAICS sectors by hand, and perform the crosswalk from IMSS geographical units to INEGI municipality boundaries constructed by IMSS.

[15] See Verhoogen (2008) on how Mexican manufacturing plants responded to negative trade shocks with quality upgrading.

I define the export manufacturing sector to consist of the ten 3-digit NAICS industries where more than 50 percent of output was exported to the US for all months in 2005-2007. This is the period immediately prior to the drop in Mexican manufacturing exports that came with the U.S. financial crisis.[16] [17] The ten industries that fall within this definition of export manufacturing are: Textile products mills; Apparel manufacturing; Leather and allied products manufacturing; Fabricated metal products manufacturing; Machinery and equipment manufacturing; Computer and electronic product manufacturing; Electrial equipment, appliance and component manufacturing; Transportation equipment manufacturing; Furniture and related products manufacturing; Miscellaneous manufacturing.

Taken together, the export manufacturing sector defined this way accounts for two thirds of all bilateral exports from Mexico to the US; around USD 13 billion of a total of USD 19 billion per month.[18] It provided for an average of 2 million jobs during 2005-2014. Here and for the rest of the paper, I define export manufacturing employment as formal (IMSS-affiliated) jobs in any of the ten industries. Export manufacturing employment amounts to close to 13 percent of all formal jobs, and 5.7 percent of all paid employment in Mexico. Within export manufacturing, the largest industry by employment and export volume is transportation equipment manufacturing: the automotive sector accounts for 25 percent of all export manufacturing jobs, and 37 percent of exports.

The vast majority of export manufacturing jobs - 85 percent - are blue-collar jobs and require full-time employment.[19] [20] This is mirrored by the characteristics of workers in export manufacturing: around 70 percent hold either an upper or lower secondary degree (which corresponds to 9-12 years of schooling), and they are on average younger than the general working-age population. Almost all (92 percent) export manufacturing firms are incorporated enterprises, and they are much larger than the average Mexican employer: three quarters of the jobs are in large firms with more than 50 employees, 90 percent in firms with more than 20 employees, and 95 percent in firms with more than 10 employees. As a point of comparison, half of all wage jobs in Mexico are in firms with 10 workers or less.

By visual inspection of the respective time series displayed in Figure 4, there is a close correlation between the real volume of exports and employment in the export manufacturing sector. Exports and employment were on a slightly increasing path until the end of 2007,

[16] This definition is in spirit similar to the way Atkin (2016) defines export manufacturing industries. However, I work with the 3-digit NAICS classification system that is applied in both Mexican and US national statistics, whereas Atkin harmonises to the international ISIC classification. I also focus on export industries after 2005, while Atkin looks at the 1985-2000 period.

[17] I obtain information on manufacturing industry production from the INEGI Monthly Manufacturing Industries Survey (EMIM).

[18] The largest exporting sector outside this definition is oil and gas that exported USD 2.4 bn per month, on average.

[19] Data on job and worker characteristics come from the ENOE and IMSS data, and data on small firm characteristics come from the matched ENOE-ENAMIN. Sampling weights are used.

[20] Full-time employment means working at least 35 hours per week during the survey reference period (the last 7 days).

then started decreasing in 2008 and fell dramatically until the middle of 2009, when they again recovered. From peak to bottom during the US financial crisis, seasonally adjusted exports fell by about 25 percent, and export manufacturing employment by about 20 percent. This collapse of manufacturing exports, and the subsequent recovery, amplify the variation in wage employment opportunities across local labour markets over time and space that I will exploit.

5.2 Self-employment in the Mexican labour market

Around 67 percent of the Mexican working-age population – individuals between 15 and 64 percent of age – are gainfully employed. Of those in paid employment, a quarter are self-employed, 40 percent are in formal wage employment, and 33 percent are in informal wage-employment. Around 11 million Mexicans were self-employed during 2005-2014, on average. The remainder of this section puts self-employment into the context of the Mexican labour market, with a particular emphasis on the firm size distribution. The section concludes by assessing some of the key model assumptions of the business environment for small firms in Mexico against the evidence in the data.

Most firms owned by self-employed entrepreneurs are very small. In fact, 80 percent of the self-employed do not have a single paid worker in their firm.[21] 15 percent of small firms have between one and four paid employees. Only 1 percent of small firms have more than 10 paid employees. Nonwithstanding that most small firms have few workers, small firms as a group are very important for job creation, as Table 1 shows. About 40 percent of all wage jobs, and 80 percent of all informal wage jobs, are created in firms with 10 employees and less. Conversely, three quarters of all workers in firms with 10 employees or less subsist in informal employment relationships. Small firms are less important as a source of formal jobs, most of which are created by larger firms. Still, 27 percent of all formal jobs are created by firms with 20 employees and less.

There is a high degree of labour churning and employment transitions in the Mexican labour market. Table 2 tabulates quarterly transition rates. Of all workers who were found self-employed in a given period, only two thirds remain self-employed when interviewed in the following trimester. 15 percent will have taken up a wage job, and a similar share will have left employment. Wage-employment is somewhat more stable: 83 percent of the wage-employed stay in the sector from quarter to quarter, and 93 percent of those in formal wage employment stay (not reported in Table 2).[22]

The data finally allows us to describe the business environment for small firms in Mexico. My model relies on two key assumptions about market failures in this business environment. First, the choice between self-employment and wage-employment is a discrete one - it is not

[21] Of these 80 percent, at least 20 percent have an unpaid worker, often a family member who helps out in the business.

[22] Workers in export manufacturing stay in wage employment at the same rate as formal workers in other industries.

possible for workers to simulatenously hold a full-time wage job and to run a small business, because of a missing market for managerial labour. Second, small firm owners are credit-constrained in their investment decisions, and have to finance investments out of their firm's cash flow. I will now look at the data in order to assess whether small firms in Mexico conform to these assumptions.

First I look at evidence whether small firms continue to exist even though the initial firm owner has changed their main occupation to wage employment. The data allows us to examine two possible ways through which this could happen: previous owners might put the firm into the trusted hands of a family member, or they might be able to continue managing their firm as a secondary, part-time activity. In order to quantify the magnitude of each of these two channels, I look at whether a firm within the same 2-digit NAICS sector continues to exist in the trimester after the previous owner has switched from self-employment to wage-employment, either with a different member of the same household, or as a secondary activity of the original entrepreneur. I find that 10.8 percent of households of previous firm owners continue to operate a business in the same sector, and that 2.5 percent of previous firm owners continue to operate a business in the same sector as their own secondary activity.[23] Conversely, however, this implies that in 88 percent of all instances, there is no evidence that a firm will be continued after the owner leaves self-employment as their main activity.[24]

Second, I look at how many firm owners take out loans for fixed investment. Small firms in Mexico in general make little use of credit. Only 18 percent of firms ever took out a loan while operating (XX percent of which from friends and relatives) and 14 percent have outstanding debt at the time of being surveyed. Similarly, only 8 percent of entrepreneurs report having used formal credit as the main source of startup capital. Furthermore, only 22 percent of all loans for operating businesses are destined mainly for fixed investment. The main purpose for most loans is to finance working capital, particularly merchandise purchases. Taken together, the data suggest that as many as 96 percent of small firms in Mexico do not finance fixed investments by means of debt.

6 Main Results

In this section I document the main results. I proceed in four steps. First, I will show that my constructed variation in export manufacturing employment is a good predictor of the observed variation. Then I will document the impact of export manufacturing shocks on the local labour market. Third, I will show how occupational choices of the self-employed

[23] Secondary activities are rare for Mexican workers: Only 6 percent of those who are self-employed in their main occupation, and 5 percent of those who are wage employed, report any secondary activity.

[24] It is not possible to link the ownership of a particular business over time, so these figures should be considered an estimate. They could constitute an overestimate if household or secondary activity firms in the same sector are in fact difference enterprises. Or they could be an underestimate if important ways of continuing the firm are not accounted for in the data, for example installing a manager who does not live in the same household. However, the figure I report can be corroborated for the subset of firms surveyed in the ENAMIN, where 87.5 percent of small business owners declare to run firms that they established themselves.

respond to the creation of jobs in export manufacturing. Finally, I will show the effect of future export manufacturing opportunities on entrepreneurial choices.

6.1 The predictive power of exports for employment

I construct the predicted change in export manufacturing jobs per thousand working-age population in each municipality according to equation (13). To remove the short-term cyclical and seasonal variation in exports that are evident from Figure 4, I apply a moving-average smoother with a bandwidth of half a year, and use the smoothed export volumes for prediction.[25] For comparison, I also construct predicted export manufacturing employment *levels*.

The regression reported in column (5) of Table 3 demonstrates the predictive power of my Bartik-style instruments. The change in export manufacturing employment (XME) predicted from initial exposure and changes in Mexican-US exports alone explains 30 percent of the variation in observed XME changes. The coefficient of 0.726 is highly significant. The following columns reveal that this does not change by much when the individual ingredients of the prediction and state trends are separately controlled for. This confirms that it is really the interaction of export volumes and initial exposure that provides for a strong instrument. The prediction in levels reported in columns (1)-(4) achieves an almost perfect fit, with an R^2 of basically unity. This is driven by the municipality fixed effects, which pick up the fact that some municipalities always have a high number of export jobs, while other municipalities always have zero export jobs. For this reason, I disregard the level instruments in my further analysis.

6.2 Export shocks and local labour markets

I document adjustments in local labour markets to export manufacturing shocks by regressing average quantities (transition rates) and prices (incomes and wages) on predicted export manufacturing employment changes, using the specification from equation (14). The standard mechanism to create the incentives for self-employed workers to move to wage employment is that increased demand for workers bids up wages. But a labour market with search frictions, the demand elasticity of wages may be small or even zero, at least in the short run. Higher labour demand might simply manifest itself in a higher offer probability. This is why I look at both margins of adjustment. I report the main results here, and relegate further analysis and discussion of the adjustment mechanisms to the appendix.

I start by reporting the effect of export manufacturing shocks on employment transition rates in Table 4. I divide the labour force into three mutually exclusive groups: those not in paid employment (NPE), the wage-employed (WE), and the self-employed (SE). As expected, transitions to wage-employment from other sectors increase when an export employment shock occurs. The effect on transitions out of self-employment is twice as high

[25] I tried different methods for smoothing, and moving averages turned out to be most effective in removing seasonal variation, and resulted in the instrument with the highest predictive power.

as on transitions out of wage-employment. Conversely, transitions into NPE and SE are reduced by export shocks; but none of the individual effects are statistically significant. In contrast to this pattern, those starting in wage-employment are slightly less likely to remain in the sector, and more likely to start a self-employed activity; but again these effects are not significant. Additional analysis in the appendix suggest the last observation is driven by movements of informal wage workers – presumably because their self-employed owners are either closing down, or because they are generally more reluctant to hire. The net effect of these transition patterns is that employment shares rise for WE and fall for NPE, by a similar magnitude (see appendix).

My preferred outcome to capture the effects on wages is the first difference of average log wages paid to workers that are new entrants to a sector. Entry wages are the closest empirical approximation of wage offers that we have. Given that we are looking at quarterly frequencies, if there is any wage stickiness then entry wages should be more responsive to shocks than wages of incumbent workers This seems to be indeed the case. In Table 5, I report the effect on entry incomes and wages by sector. The magnitude of coefficient estimates suggests that an additional export manufacturing job per 1000 workers in the local municipality increases SE entry incomes by 0.25 percent, and wages of new informal workers by 0.1 percent. Wages of formal workers – including workers in export manufacturing – decrease slightly. Results on wages of both entrants and continuing workers in the appendix are qualitatively similar, but smaller in magnitude and not always significant.

There are at least two possible interpretations for these findings. First, wage offers for self-employed and informal workers might increase due to an entry selection effect: faced with a higher opportunity cost in these sectors because of the available XME opportunities, workers increase their reservation wages. Consequently, accepted wage offers are higher, and only the more profitable business ventures are pursued. Second, the productivity of small firms might have increased – resulting in higher SE incomes – and entrepreneurs share some of these gains with their workers, most of whom are informal.

6.3 Export shocks and occupational choice

A key part of the driving force of the model is the fact that self-employed small firm owners respond to the incentives that wage employment opportunities provide. In my simple model, the only occupational choice is between self-employment and wage employment. In the real world , the choice between non-employment and employment constitutes another important margin. For the purpose of the model, any of these margins matters to the extent that they influence the probability to stay in or leave self-employment.

In Table 6, I report the effect of an export shock in the local municipality on the propensity of small firm-owners to leave self-employment (to either WE or NPE) or to stay self-employed, using the regression model (15). In column (2) I include the standard controls: trimester fixed effects, initial municipality XME exposure, and state fixed effects. These controls do not affect the coefficient by much, but increase precision compared to the estimation

without controls in column (1). In column (6), I add a vector of controls at the individual level. The coefficient estimate implies that an additional export manufacturing wage job per thousand workers in the local municipality – a 0.1 percent increase in jobs per adult– raises the probability that a small firm owner leaves self-employment by 0.135 percent. The coefficient estimates are basically unchanged when I restrict attention to the margin of choice between self-employment and wage employment only (reported in the appendix).

In a next step, I repeat the exercise from Table 6, but successively shift the export shock to the past and to the future, respectively. How occupational choice reacts to future export shocks tells us about how individuals respond to changes in market expectations; and how choices react to past export shocks is informative about the speed of labour market adjustment mechanisms. In Figure 5, I graphically report the results from these individual regressions. The bar at zero on the horizontal axis corresponds the coefficient in column (6) of Table 6. To its right are coefficients for the effects of future shocks, and to its left for past shocks. The asymmetric figure shows that occupational choice of small firm owners does not respond to future, anticipated export manufacturing employement shocks. Their propensity to leave self-employment responds to contemporaneous, and to some degree to past shocks – the effect at the first lag is statistically significant at 1 %, and even slightly larger than the contemporaneous effect.

Taken together, the results from this section show that small firm owners are more likely to shut down their businesses at the time when job opportunities in export manufacturing arrive – but not before. This adjustment continues for another quarter or two, but not beyond.

6.4 Export shocks and entrepreneurial choice

Armed with evidence on what export shocks do to local labour markets, and how individual occupational choices of small firm owners react to these shocks, I now proceed to testing for whether entrepreneurial choices, too, respond to local export manufacturing employment (XME) shocks. In particular, I test for whether the growth of small firms is affected by export manufacturing shocks.

My main measure of firm growth is the change in firm size of small firms, expressed by the number of workers that small firms employ. This variable is available for all small firms surveyed in the ENOE. In my model firm growth is affected by *future* wage employment opportunities. In my regression, I therefore shift the export shock by one quarterin to the future. Table 7 reports the results. The full specificiation in column (6) controls for the individual ingredients of predicted export manufacturing job creation, and for a number of factors that vary at the individual level, most importantly initial firm size. The coefficient estimate implies that an that an additional future export manufacturing wage job per thousand workers in the local municipality reduces quarterly growth of small firms by 0.005 workers, compared to an average growth of 0.02 workers.

The observation that *future* export employment opportunities matter for small firm growth

holds more generally when we again examine the effects of different lags and leads of the export shock. I document this pattern in Figure 6. XME shocks up to a year into the future have a significant and negative effect on small firms job growth. Past XME shocks, however, do not appear to have any effect. This is in contrast to the finding on occupational choice, which is primarily affected by XME shocks of the recent *past* .

6.4.1 Direct impact on capital

In my model, firm growth is expressed as investment into a firm's capital stock. Although firm size in number of workers should be positively related to firm size measured in capital stock units, we ideally would like to see direct evidence on whether export manufacturing opportunties affect investment.[26] Here I offer such a test.

I report this test as secondary evidence due to a number of important data restrictions. While firm size expressed by the number of workers is available for firms in all 40 trimestral waves of the ENOE, a direct measure of fixed capital investment is only available in 3 waves when the supplemental ENAMIN microenterprise module was administered. This limits the variation across local labour market constellations available for identification, the power of my tests, and the possibilities to net out aggregate time-series variation as the driving force behind results. These limititations are exacerbated by the fact that, because of changes in measurement, I need to separately analyse the 2008 wave and the 2010/2012 waves.[27] Finally, while I am able to run a specification where investment is the first difference of firm size, I am not able to run a first-differenced specification in investment itself due to the cross-sectional nature of the data.

With these caveats in mind, Tables 8 and 9 report the results of export manufacturing employment shocks on investment for 2008 and 2010/12, respectively. The measure of investment covers the last year, and accordingly I express the XME shock as the difference in employment over a whole year, or four trimesters. For 2008, the coefficient estimate of the fully specified model in column (6) is significantly negative. An additional job in the local labour market reduces investment of small firms by about 5 percent of average investment. For 2010/12, the coefficient estimate is much smaller and not significant.

[26] Assuming a Cobb-Douglas production function in capital and labour with a unit elasticity of subsitution and no labour adjustment costs, the ratio of capital to labour inputs should be constant. More generally, if there are labour adjustment costs, then a filled vacancy itself can be understood as an asset. In a dynamic model, such an asset state variable behaves similarly to the capital stock in my simple model with a single production input.

[27] The questionnaire changed in two important ways between 2008 and 2010. First, in 2008 investment was elicited through a single-item question, where from 2010 on investment was constructed by summing up item-to-item responses on individual categories. Second, in 2008 the question on investment came after the question on capital stock, while from 2010 the order was reversed. Together, these changes result in a much higher non-response rate in 2008, plus in an elicited distribution of investment that, at any point, was also much higher in 2008 than in later years.

7 Mechanisms and Heterogeneity

The main results from my analysis provide evidence that is consistent with the setup and the predictions of my theoretical model. Using variation in job opportunities in export manufacturing industries in local labour markets that arise from the interaction of US demand for Mexican goods and local initial exposure to export manufacturing industries, I show how wage employment opportunities affect occupational and entrepreneurial choices of small firm owners. In this section I provide further evidence to argue that the effects on entrepreneurial choices – reduced growth and investment – arise *through* the channel of anticipated occupational choice. To make this argument, I first rule out possible alternative explanations. In a second step, I report the heterogeneity of effects. I relegate other robustness checks to the appendix.

7.1 Alternative Explanations

I consider various alternative explanations for my findings. These alternative explanations all operate through the mechanism that local export employment manufacturing shocks could affect margins of entrepreneurial choice other than through the expectation of leaving self-employment.

First, local export manufacturing shocks could affect the equilibrium of the local economy, for example through their effects on local wages. Indeed, in section 6.2, I document how starting incomes for self-employed workers and entry wages for informal employees rise with XME shocks. This is a concern because higher labour costs – just like a higher probability of leaving self-employment – reduce the incentives for hiring workers. A crucial element to distinguish between these two mechanisms is timing. In the appendix, I show that the pattern of effects on informal entry wages over time is similar to the pattern for occupational choice that I reported in Figure 5. However, while today's hiring decisions of small firm owners should respond to expectations about their own *future* occupational choices, hiring today should only be affected by wages paid to new workers *today*, not by wages paid to the new workers of tomorrow.[28] The documented effects on wages can therefore not explain the fact the entrepreneurial choices are affected by future XME shocks.

Furthermore, wages should only matter for decisions of small firms who actually employ workers. For the 80 percent of owners of firms without any paid workers, wages should have no effect on expected future profits.[29] In Table 10, I examine the effects of export shocks on investment in 2008 separately by firm size, both by means interaction terms and

[28] Most of the hiring is informal, as documented in section 5.2. Since legal restrictions on firing workers by definition only apply to formal jobs, firm owners should not expect that they will be forced to pay higher wages in the future because they cannot lay off their workers.

[29] Informal wages might still have an effect on investment through an occupational choice mechanism. An increase in informal wages improves alternative employment options for the self-employed in the same way that an increase in XME opportunities does. Such a mechanism then does not constitute an alternative explanation, but rather a variant of the occupational choice mechanism I am testing for.

by splitting the sample. The estimates of the effects on investment by firms without paid workers are negative and statistically significant throughout. This provides another piece of evidence that wage adjustment are not the mechanism driving the documented effects on firm growth.

A second possibility is that XME shocks lead to local demand spillovers. Export manufacturing firms do not compete with other businesses for the local market; demand spillovers can hence be expected to be positive. The local multiplier mechanism therefore works in the opposite direction to the occupational choice channel. In order to assess whether this mechanism is at play and leads to an upward bias of my estimates in section 6.4, I investigate whether XME shocks have a short-term effect on prices. I obtain monhtly prices indices at the product level for 42 metropolitan areas from INEGI and construct a metropolitan-area level measure of XME shocks. [STILL PENDING FOR A FUTURE REVISION OF THE PAPER.]

A third alternative mechnism originates in the fact that XME shocks increase the value of employment in occupations other than self-employment. This implicitly provides an insurance for entrepreneurs against the loss of income when their business venture fails and they are forced to shut it down and leave self-employment.[30] This can in turn encourage entrepreneurs to take greater risks, and we should expect to see an increase in the probability of leaving self-employment together with stronger growth in the surviving firms.[31] These patterns work again in the opposite direction of what I find.

7.2 Testing for heterogeneous effects

I explore heterogeneous effects of XME shocks on occupational and entrepreneurial choices along a number of dimensions: sub-period, size of the locality where a worker resides, gender and educational achievement. I do so by estimating model (15) on subgroups.

In columns (1)-(3) of Tables 11 and 12, I split the sample by sub-periods. I consider three sub-periods that differ by how export manufacturing employment develops (see Figure 4): the pre-crisis period 2005 to 2007 where export manufacturing employment stagnated or at best grew slowly, the crisis years 2008 and 2009 where aggregate export manufacturing plummeted by 20 percent, and the recovery years from 2010 to 2014. The coefficient estimate for occupational choice in 2008/09 is similar to the overall estimate reported in column (6) of Table 6 and statistically significant at the 10 percent level. The estimate for 2010-14 is about twice as large, but not significant, and the estimate for 2005-07 is close to zero. The effects for firm growth for all three sub-periods are about as large or larger in magnitude than the overall effect from column (6) of Table 7, but none is individually significant. These results

[30] See Gottlieb, Townsend, and Xu (2016) for evidence on the implicit insurance of job-protected leave for women giving birth in Canada.

[31] However, increased entry might also create stronger competition and lead to job destruction in incumbent firms; see Hombert, Schoar, Sraer, and Thesmar (2014) for evidence from France in the context of a welfare reform aimed at insuring unemployed entrepreneurs if they enter new business ventures.

suggest that the mechanism is at play both during times of recession and of growth in export manufacturing. It may not be as strong in times when export manufacturing employment is stagnant, such as during 2005-2007.

Next I analyse effects separately by size of the locality of residence. The mechanism I propose the existence of a well-functioning market for wage labour. To be empirically relevant, it further presumes that small firms are on a growth trajectory in the first place, which can then potentially be impacted by new job opportunities outside of self-employment. I expect both of these conditions to be met to a larger degree in labour markets of large towns and cities, as opposed to more rural areas. This conjecture is confirmed by the results reported in columns (4)-(7) of Tables 11 and 12. Only in cities with a population of more than 100,000 do XME shocks affect both the occupational and the entrepreneurial choices of small firm owners, in the directions predicted by the model. Descriptive statistics reveal that employment growth in small firms located in cities is by an order of magnitude larger than in villages and rural areas.

A similar logic applies to testing for heterogeneous effects by gender. I expect men both to be more reactive to new job opportunities, and to be running firms that are on higher growth trajectories in the first place. Results in columns (1) and (2) of Tables 13 and 14 show that the second conjecture is correct: the effect of XME opportunities on occupational choice is prevalent for men. The effect is a precisely estimated zero for women. However, the first conjecture turns out not to be true: both male and female firm owners respond to new XME opportunities by shutting down their firms, women perhaps even more so (although I cannot reject equality of coefficients between columns (1) and (2) of Table 13). It seems that the difference between male and female-owned businesses is that businesses of men are much more likely to grow per so, in contrast to female-owned businesses.

Finally I split the sample by education in columns (1) and (2) of Tables 13 and 14. The effects of XME shocks on the probability to take up a wage job are very similar across education level. However, again only those with growing businesses – those with secondary and tertiary education – respond by reducing firm growth to the occupational choice adjustments brought by XME shocks. Only the results for workers with secondary education are statistically significant – as noted in section 5.1, around 60-70 percent of all workers in export manufacturing are educated to a secondary level.

8 Summary and concluding remarks

In this paper, I address the question of whether occupational and entrepreneurial choices of small firm owners are separable, or whether greater wage employment opportunities for entrepreneurs translate into lower firm growth. I analyse this mechanism theoretically and empirically. Theoretically, I establish how uncertainty embodied by search frictions that entrepreneurs face in the market for alternative employment opportunities is captured by the effective discount factor that is applied to returns on entrepreneurs' investment. High discount factors lead to low levels of investment even when returns to capital are large. This

is exacerbated by the possibility that firms that are initially small can find themselves in a poverty trap.

I provide an empirical test and application for small firms in Mexico over the 2005-2014 decade. I exploit shocks to employment in the Mexican export manufacturing sector brought by the bust-and-boom of exports to the US during the financial crisis of 2008/09 and the subsequent recovery. I document how these shocks increase the transitions of small firm owners out of self-employment into wage employment. Finally I find that small firm owners reduce their capital and labour inputs in anticipation of a future shock, and present supplementary evidence to argue that this reduction is indeed driven by expectations about future occupational choices.

[HERE INSERT A BACK-OF-THE-ENVELOPE CALCULATION AT A LATER STAGE.]

These findings have ramnifications for policy, from at least two perspectives. First, from a perspective of policymakers whose goals are to foster entrepreneurship and ultimately leverage small firms to create much-desired wage-employment opportunities, the findings might seem sobering. Not only does the average small firm owner seem like a 'relucant entrepreneur' (Banerjee and Duflo (2011)), ready to jump ship once better opportunities for in wage employment arise. Perhaps even more importantly, the group of small firm owners who reduce their investment and hiring is potentially much larger than those who end up taking up wage jobs – namely all those who expect that they might do so. However, the model does offer constructive lessons for policy: understanding the trade-offs for small firm owners should help designing better future policies. Furthermore, not all small firms are predicted to experience severe adverse effects from the expansion of large establishments that provide wage opportunities. Successful entrepreneurs will not see factory jobs as serious alternatives; an observation that generalises to *any* kind of wage job if only the business is sufficiently profitable. Even more, to the extent that positive local product market spillovers of export manufacturing are present, these are probably directed at the larger and more succesful amonst small firms who employ the necessary managerial, human and physical capital to innovate or to link with large modern establishments.

Secondly, the findings also have ramnifications from a macroeconomic perspective. The fact that (formal) employment in large incorporated firms and (informal) employment in small owner-operated firms move in opposite directions can be understood as a form of automatic stabiliser in the labour market. This applies especially in economies of developing countries which have large self-employment at the same time of being exposed to more volatile external shocks. I showed in section 7.2 that the mechanism in this paper applies both in times of positive and negative trade-induced employment shocks. My findings suggest that the spillover of its big neighbour's Great Recession on the Mexican labour market was partly mitigated by the fact that small firm owners were more eager to employ informal workers in their firms that they would have.

References

Acemoglu, D., D. Autor, D. Dorn, G. H. Hanson, and B. Price (2016): "Import Competition and the Great US Employment Sag of the 2000s," *Journal of Labor Economics*, 34(S1 Part 2), S141–S198.

Adão, R. (2015): "Worker Heterogeneity, Wage Inequality, and International Trade: Theory and Evidence from Brazil," Discussion paper, mimeo.

Aghion, P., and P. Bolton (1997): "A theory of trickle-down growth and development," *The Review of Economic Studies*, 64(2), 151–172.

Atkin, D. (2016): "Endogenous Skill Acquisition and Export Manufacturing in Mexico," *American Economic Review*, 106(8), 2046–85.

Autor, D., D. Dorn, and G. H. Hanson (2013): "The China syndrome: Local labor market effects of import competition in the United States," *The American Economic Review*, 103(6), 2121–2168.

Bandiera, O., I. Barankay, and I. Rasul (2011): "Field experiments with firms," *The Journal of Economic Perspectives*, 25(3), 63–82.

Banerjee, A., and E. Duflo (2011): *Poor Economics: A Radical Rethinking of the Way to Fight Global Poverty*. PublicAffairs.

Banerjee, A., D. Karlan, and J. Zinman (2015): "Six Randomized Evaluations of Microcredit: Introduction and Further Steps," *American Economic Journal: Applied cEconomics*, 7(1), 1–21.

Banerjee, A., and S. Mullainathan (2010): "The shape of temptation: Implications for the economic lives of the poor," Discussion paper, National Bureau of Economic Research Working Paper 15973.

Banerjee, A. V., and A. F. Newman (1993): "Occupational choice and the process of development," *Journal of political economy*, pp. 274–298.

Benjamin, D. (1992): "Household composition, labor markets, and labor demand: testing for separation in agricultural household models," *Econometrica: Journal of the Econometric Society*, pp. 287–322.

Blattman, C., and S. Dercon (2016): "Occupational Choice in Early Industrializing Societies: Experimental Evidence on the Income and Health Effects of Industrial and Entrepreneurial Work," Discussion paper, National Bureau of Economic Research Working Paper 22683.

Blattman, C., N. Fiala, and S. Martinez (2014): "Generating Skilled Self-Employment in Developing Countries: Experimental Evidence from Uganda," *Quarterly Journal of Economics*, 129(2).

Bosch, M., and W. Maloney (2010): "Comparative analysis of labor market dynamics using markov processes: An application to informality," *Labour Economics*, 17(4), 621–631.

Costa, F., J. Garred, and J. P. Pessoa (2016): "Winners and losers from a commodities-for-manufactures trade boom," *Journal of International Economics*.

Dauth, W., S. Findeisen, and J. Suedekum (2014): "The rise of the East and the Far East: German labor markets and trade integration," *Journal of the European Economic Association*, 12(6), 1643–1675.

David, J. M., H. A. Hopenhayn, and V. Venkateswaran (2016): "Information, Misallocation and Aggregate Productivity*," *The Quarterly Journal of Economics*.

De Janvry, A., M. Fafchamps, and E. Sadoulet (1991): "Peasant household behaviour with missing markets: some paradoxes explained," *The Economic Journal*, 101(409), 1400–1417.

De Mel, S., D. McKenzie, and C. Woodruff (2008): "Returns to capital in microenterprises: Evidence from a field experiment," *The Quarterly Journal of Economics*, 123(4), 1329–1372.

Diamond, D. W. (1984): "Financial intermediation and delegated monitoring," *The Review of Economic Studies*, 51(3), 393–414.

Dix-Carneiro, R. (2014): "Trade liberalization and labor market dynamics," *Econometrica*, 82(3), 825–885.

Eckstein, Z., and K. I. Wolpin (1989): "Dynamic Labour Force Participation of Married Women and Endogenous Work Experience," *The Review of Economic Studies*, 56(3), 375–390.

Evans, D., and B. Jovanovic (1989): "An Estimated Model of Entrepreneurial Choice under Liquidity Constraints," *Journal of Political Economy*, 97(4), 808–827.

Evans, D. S. (1987): "Tests of alternative theories of firm growth," *Journal of Political Economy*, 95(4), 657–674.

Fafchamps, M., D. McKenzie, S. Quinn, and C. Woodruff (2014): "Microenterprise Growth and the Flypaper Effect: Evidence from a Randomized Experiment in Ghana," *Journal of Development Economics*, 116, 211–226.

Fafchamps, M., and S. Quinn (2015): "Aspire," *NBER Working Paper No. 21084*.

Fama, E. F. (1980): "Agency Problems and the Theory of the Firm," *Journal of Political Economy*, pp. 288–307.

Fields, G. (1975): "Rural-urban Migration, Urban Unemployment and Underemployment, and Job-Search Activity in LDCs," *Journal of Development Economics*, 2(2), 165–187.

Gottlieb, J. D., R. R. Townsend, and T. Xu (2016): "Experimenting with entrepreneurship: the effect of job-protected leave," .

Günther, I., and A. Launov (2012): "Informal Employment in Developing Countries: Opportunity or Last Resort?," *Journal of Development Economics*, 97(1), 88–98.

Harris, J., and M. Todaro (1970): "Migration, Unemployment and Development: A Two-Sector Analysis," *American Economic Review*, 60(1), 126–142.

Haywood, L., and P. Falco (2016): "Entrepreneurship vs Joblessness: Explaining the Rise in Self-Employment," *Journal of Development Economics*, 118, 245–265.

Heath, R., and A. M. Mobarak (2015): "Manufacturing growth and the lives of Bangladeshi women," *Journal of Development Economics*, 115, 1–15.

Hombert, J., A. Schoar, D. Sraer, and D. Thesmar (2014): "Can Unemployment Insurance Spur Entrepreneurial Activity?," Discussion paper, National Bureau of Economic Research Working Paper 20717.

Hopenhayn, H. (1992): "Entry, Exit, and Firm Dynamics in Long Run Equilibrium," *Econometrica*, 60(5), 1127–1150.

Jovanovic, B. (1982): "Selection and the Evolution of Industry," *Econometrica*, 50(3), 649–670.

Karlan, D., R. Knight, and C. Udry (2015): "Consulting and Capital Experiments with Microenterprise Tailors in Ghana," *Journal of Economic Behaviour and Organization*, 118, 281–302.

Karlan, D., and M. Valdivia (2011): "Teaching Entrepreneurship: Impact of Business Training on Microfinance Clients and Institutions," *Review of Economics and Statistics*, 93(2), 510–527.

Kihlstrom, R., and J.-J. Laffont (1979): "A General Equilibrium Entrepreneurial Theory of Firm Formation Based on Risk Aversion," *Journal of Political Economy*, 87(4), 719–748.

Killingsworth, M. R., and J. J. Heckman (1986): "Female labor supply: A survey," *Handbook of labor economics*, 1, 103–204.

Koelle, M., and S. Quinn (2016): "Self-Employment, Capital and Job Search in Urban Ghana: Evidence from a Structural Model," Discussion paper, mimeo.

Kraay, A., and D. McKenzie (2014): "Do Poverty Traps Exist? Assessing the Evidence," *Journal of Economic Perspectives*, 28(3), 127–148.

Lewis, W. A. (1954): "Economic Development with Unlimited Supplies of Labour," *The Manchester School*, 22(2), 139–191.

Lucas, R. (1978): "On the Size Distribution of Business Firms," *The Bell Journal of Economics*, 9(2), 508–523.

Magnac, T. (1991): "Segmented or Competitive Labor Markets," *Econometrica*, 59(1), 165–187.

McCaig, B., and N. Pavcnik (2014): "Export markets and labor allocation in a low-income country," Discussion paper, National Bureau of Economic Research Working Paper 20455.

McCall, J. (1970): "Economics of Information and Job Search," *The Quarterly Journal of Economics*, 84, 113–126.

McKenzie, D. (2015): "Identifying and Spurring High-Growth Entrepreneurship: Experimental Evidence from a Business Plan Competition," .

McKenzie, D., and C. Woodruff (2008): "Experimental evidence on returns to capital and access to finance in Mexico," *The World Bank Economic Review*, 22(3), 457–482.

——— (2014): "What Are We Learning from Business Training and Entrepreneurship Evaluations around the Developing World?," *The World Bank Research Observer*, 29(1), 48–82.

Mortensen, D. (1970): "Job search, the Duration of Unemployment, and the Phillips Curve," *American Economic Review*, 60(5), 847–862.

Piketty, T. (1997): "The dynamics of the wealth distribution and the interest rate with credit rationing," *The Review of Economic Studies*, 64(2), 173–189.

Ramsey, F. (1928): "A Mathematical Theory of Saving," *The Economic Journal*, 38, 543–559.

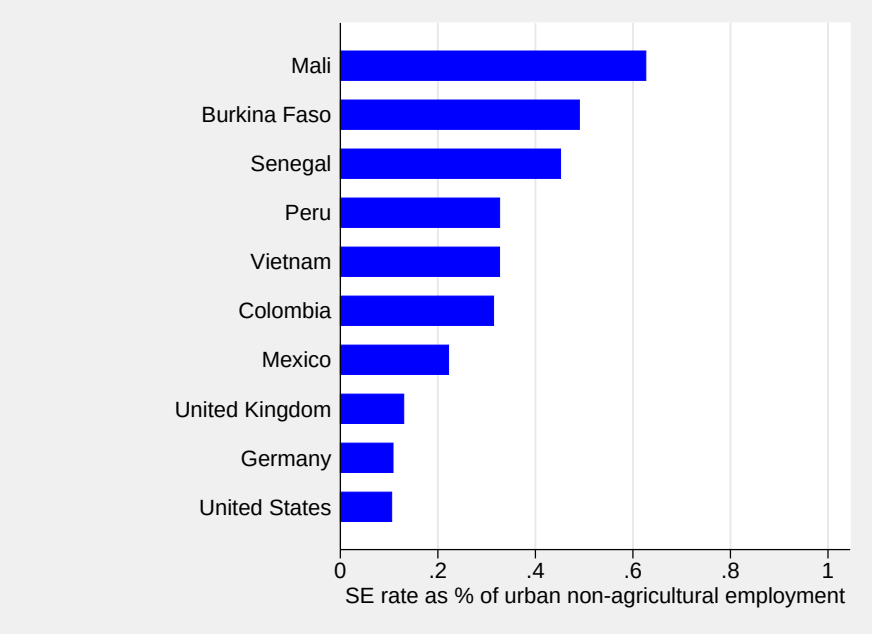
Stigler, G. (1962): "Information in the Labor Market," *Journal of Political Economy*, 70, 94–105.

Vereshchagina, G., and H. A. Hopenhayn (2009): "Risk taking by entrepreneurs," *The American Economic Review*, 99(5), 1808–1830.

Verhoogen, E. A. (2008): "Trade, Quality Upgrading, and Wage Inequality in the Mexican Manufacturing Sector," *The Quarterly Journal of Economics*, 123(2), 489–530.

FIGURE 1

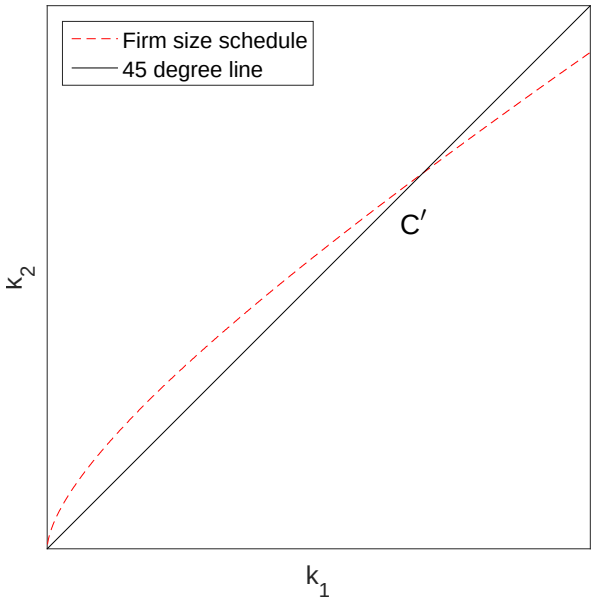
INTERNATIONAL COMPARISON OF NON-RURAL NON-AGRICULTURAL SELF-EMPLOYMENT



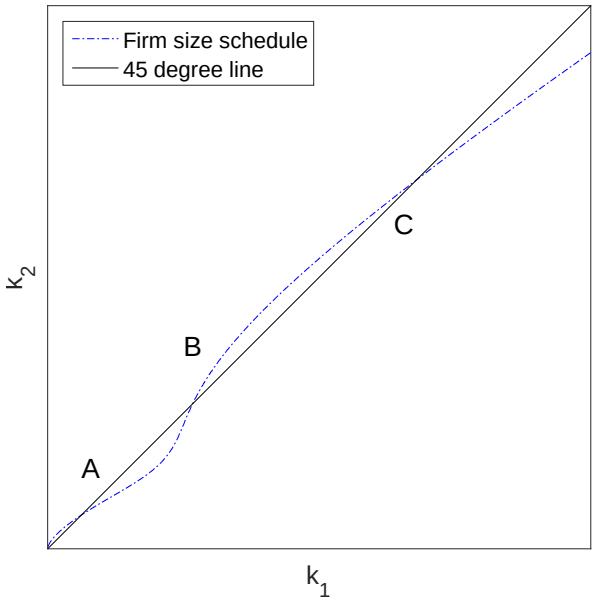
Notes: Own calculation. Data restricted to capital cities or metropolitan areas with at least 1M population for the following sources: 2007 ENOE (Mexico), 2007 ESLF (Colombia) and WIEGO (2009) unified dataset compiled from: 2003 1-2-3 survey (Mali, Burkina Faso, Senegal); 2006 ENAHO (Peru), 2007 LFS (Vietnam), and 2007 LFS tabulations (UK). Data restricted to non-agricultural self-employment for 2004 Microcensus tabulations (Germany) and 2007 CPS tabulations (US).

FIGURE 2

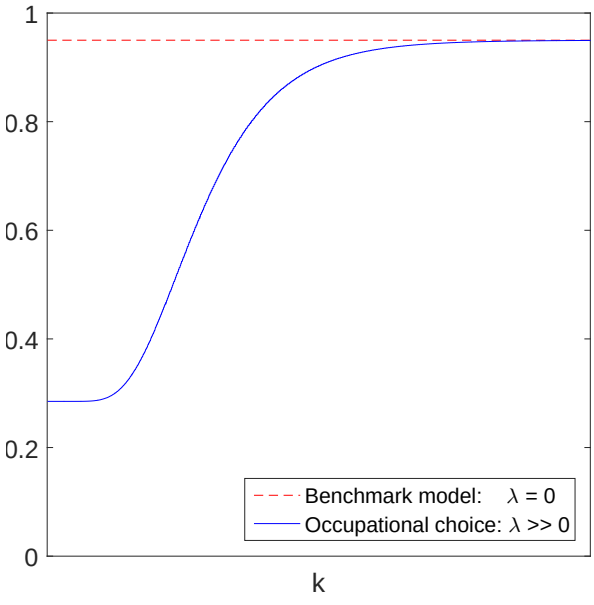
LAW OF MOTION FOR ASSETS



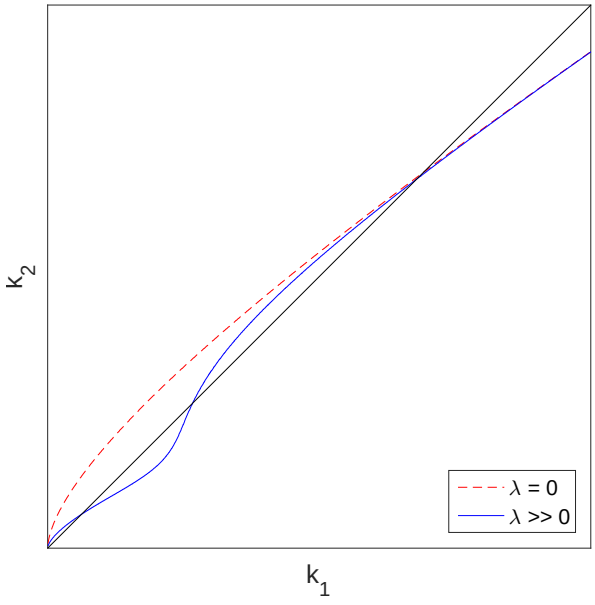
(a) Neoclassical Benchmark: $\lambda = 0$



(b) Occupational choice channel: $\lambda >> 0$



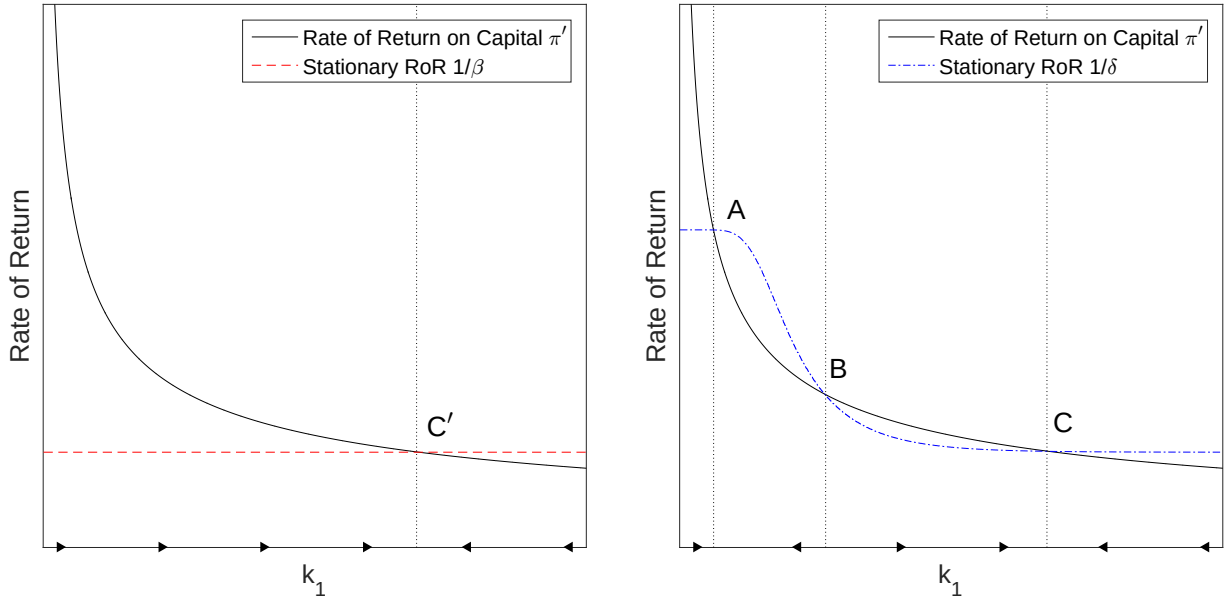
(c) Comparison of discount factors



(d) Comparative statics

FIGURE 3

INVESTMENT DECISIONS AND THE RATE OF RETURN

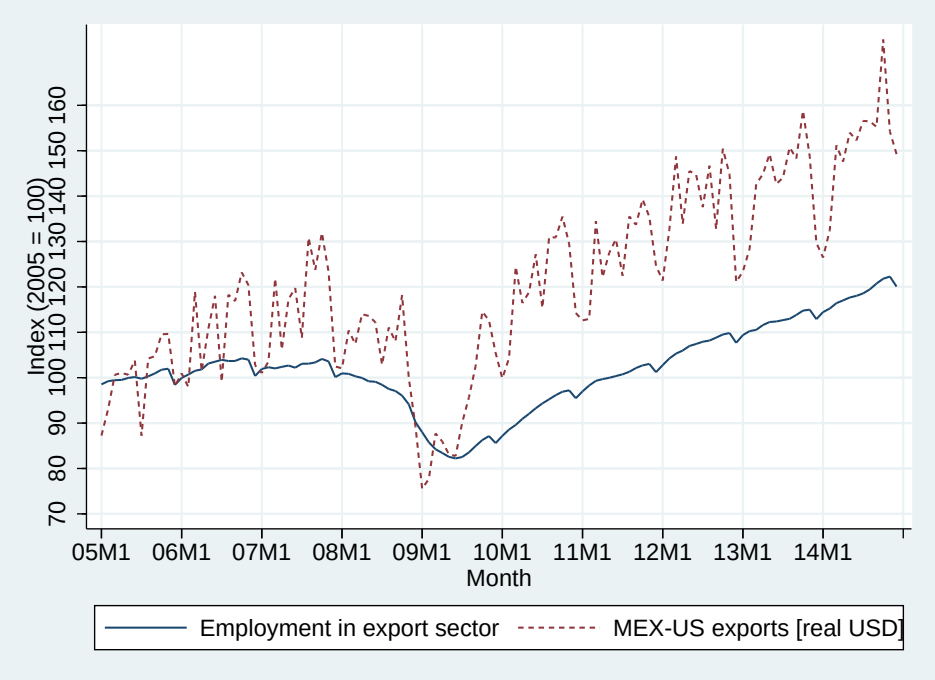


(a) Neoclassical Benchmark: $\lambda = 0$

(b) Occupational choice channel: $\lambda >> 0$

FIGURE 4

EMPLOYMENT AND EXPORTS IN MEXICAN EXPORT MANUFACTURING



Source: IMSS end-of-month social security records on formal employment; US Census Bureau monthly volume of imports from Mexico in nominal USD, deflated with US CPI. Each time series normalised to their respective average annual level in 2005.

TABLE 1

EMPLOYMENT BY FIRM SIZE IN MEXICO

Firm Size	**Self-Empl.**	**Formal WE**	**Informal WE**
1 employee	82.5	0.2	8.8
2-5 employees	14.9	6.3	58.5
6-10 employees	1.5	8.0	12.6
11-15 employees	0.5	5.9	4.2
16-20 employees	0.2	6.8	3.5
21-30 employees	0.2	7.0	2.6
31-50 employees	0.1	9.3	2.7
51-100 employees	0.1	12.0	2.5
101-250 employees	<0.1	10.5	1.5
251-500 employees	<0.1	7.2	0.7
501+ employees	<0.1	26.9	2.3

Source: ENOE, 2004-2015. Each column contains proportion of employment type that are employed in a firm that falls into a particular size bracket. Average proportion across decade.

TABLE 2

TRANSITION RATES IN THE MEXICAN LABOUR MARKET

	Employment status next quarter					
Employment status	OLF	WE	SE	OE	UE	Total
Out of LF %	69.8	8.0	5.4	3.2	13.6	100.0
Wage-employed %	5.7	82.8	5.7	1.2	4.5	100.0
Self-employed %	10.5	15.4	67.5	2.7	3.9	100.0
Other Employment %	24.4	14.2	11.0	43.4	6.9	100.0
Unemployed %	43.9	20.8	6.7	2.9	25.7	100.0
Total %	30.2	41.2	15.5	3.8	9.2	100.0

Source: ENOE, 2004-2014. Quarterly transitions for all respondents aged 15-64 with non-missing employment status in adjacent periods. OLF = Out of labour force; SE = self-employed; WE = wage employed; OE = unpaid employment; UE = unemployed.

TABLE 3

GOODNESS OF FIT OF PREDICTED EXPORT MANUFACTURING EMPLOYMENT

	(1) Levels	(2) Levels	(3) Levels	(4) Levels	(5) FD	(6) FD	(7) FD
Pred. XME/WAPop	0.972***	0.972***	1.079***	1.083***			
	(340.63)	(342.17)	(16.58)	(16.89)			
Δ Pred. XME/WAPop					0.726***	0.727***	0.876***
					(26.98)	(25.36)	(8.96)
Constant	0.257	12.47**	0.346*	12.58**	-0.0196	0.838*	0.945*
	(1.42)	(2.09)	(1.81)	(2.15)	(-0.79)	(1.67)	(1.90)
Initial XME	No	No	Yes	Yes	No	No	Yes
Trimester FE	No	Yes	No	Yes	No	Yes	Yes
State FE	No	Yes	No	Yes	No	Yes	Yes
Observations	97520	97520	97520	97520	95082	95082	95082
R^2	0.994	0.994	0.994	0.994	0.303	0.304	0.331

t-statistics in parentheses.

This table reports regression of predicted on actual export manufacturing employment for all 97,520 unique local labour market constellations in the cross-section / 95,082 in the first difference (2,438 non-D.F. municipalities over 40/39 trimesters). Municipal employment variables are normalised per 1000 working-age population of the corresponding trimester and municipality, and winsorised at the top and bottom 0.05%. Two-way clustered standard errors by municipality and trimester.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

TABLE 4

EFFECT OF EXPORT SHOCK ON TRANSITION RATES

		(1) To NPE	(2) To WE	(3) To SE
From NPE	Δ Pred. XME/WAPop	-0.0441	0.0581**	-0.0107
		(0.0241)	(0.0209)	(0.0140)
	Observations	27920	27876	27920
	Mean transition rate	83.44	10.89	5.722
From WE	Δ Pred. XME/WAPop	-0.00650	-0.00845	0.0226
		(0.0295)	(0.0397)	(0.0300)
	Observations	27054	27082	27082
	Mean transition rate	11.47	83.65	4.838
From SE	Δ Pred. XME/WAPop	-0.0150	0.0915***	-0.0765
		(0.0595)	(0.0327)	(0.0629)
	Observations	26904	26904	26904
	Mean transition rate	18.90	14.70	66.39

Standard errors in parentheses

This table reports regression of transitions (in percentage points, rowwise) on Bartik instrument, in first differences. Unit of observation is an unbalanced panel of Mexican municipalities (apart from D.F.) over 39 quarters from 2005 to 2010 (2005Q1 only used for calculating first difference). All employment variables are normalised per initial 1000 working-age-population of the corresponding trimester and municipality, and winsorised at the top and bottom 0.05%. All specifications include a constant, and per standard control for state, trimester, and 2005 export employment. Individual controls are municipal average levels of education, experience, and share of men. Locality controls are locality size distribution within municipality. Observations are weighted by working-age population. Standard errors clustered by municipality.

TABLE 5

EFFECT OF EXPORT SHOCK ON WAGES

	(1) Δ SE	(2) Δ WE	(3) Δ Formal	(4) Δ Informal
Δ Pred. XME/WAPop	0.254***	0.0497	-0.0329	0.109**
	(0.0932)	(0.0357)	(0.0449)	(0.0442)
Observations	31818	35205	23404	34597
R^2	0.000	0.000	0.000	0.000
ymean	-0.908	-0.567	-0.353	-0.228

Standard errors in parentheses

This table reports regression of 100× log entry income differences on Bartik instrument changes. Unit of observation is an unbalanced panel of Mexican municipalities (apart from D.F.) over 40 quarters from 2005 to 2010. All employment variables are normalised per initial 1000 working-age-population of the corresponding trimester and municipality, and employment and outcome variables are winsorised at the top and bottom 0.01%. All specifications include a constant, and per standard control for state, trimester, 2005 export employment. Individual controls are municipal average levels of education, experience, and share of men. Locality controls are locality size distribution within municipality. Observations are weighted by working-age population. Standard errors clustered by municipality.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

TABLE 6

EFFECT OF EXPORT SHOCK ON PROPENSITY TO STAY SELF-EMPLOYED

	(1) Leave SE	(2) Leave SE	(3) Leave SE	(4) Leave SE	(5) Leave SE	(6) Leave SE
Δ Pred. XME/WAP	0.124	0.108***	0.291**	0.174	0.165	0.135***
	(0.108)	(0.0248)	(0.136)	(0.139)	(0.115)	(0.0512)
Municipality controls	No	Yes	No	No	No	Yes
Individual controls	No	No	Yes	No	No	Yes
Firm controls	No	No	No	Yes	No	Yes
Locality controls	No	No	No	No	Yes	Yes
Observations	928204	928204	928204	732948	928204	732948
R^2	0.000	0.005	0.035	0.011	0.001	0.046
ymean	33.40	33.40	33.40	33.51	33.40	33.51

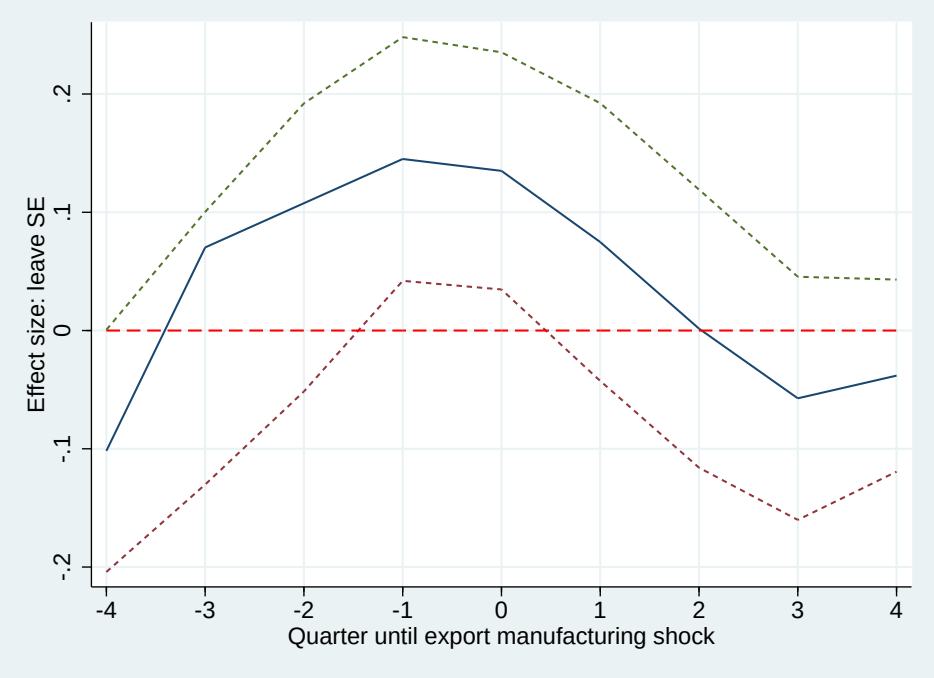
Standard errors in parentheses

This table reports regression of probability of probability of leaving self-employment on predicted quarterly export manufacturing employment difference in the local municipality. Unit of observation are inviduals from 40 quarterly ENOE waves 2005-2014 who are self-employed, and who are observed in the following period. Municipal export employment variables are normalised per 1000 working-age-population of the corresponding month and municipality, and employment and outcome variables are winsorised at the top and bottom 0.01%. Two-way clustered standard errors by municipality and trimester. Municipality controls include wave dummies, state dummies, and 2005 export manufacturing employment. Individual controls include gender, education level, and experience quadratic. Firm control include firm size bins, and profits. Locality controls include locality size category. All specifications include a constant, and ENOE sampling weights are used.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

FIGURE 5

THE TIMING OF OCCUPATIONAL RESPONSES TO EXPORT SHOCKS



Source: Results from regression of model 15, using the specification reported in Column (6) of Table 6. Horizontal axis documents the number of quarters s that the dependent variable has been shifted. Reported 95 % confidence intervals use two-way clustered standard errors by municipality and trimester.

TABLE 7

EFFECT OF EXPORT SHOCK ON SMALL FIRM GROWTH

	(1) Δ Firm Size	(2) Δ Firm Size	(3) Δ Firm Size	(4) Δ Firm Size	(5) Δ Firm Size	(6) Δ Firm Size
F.Δ Pred. XME/WAP	0.0632	-0.122	-0.0628	-0.348	-0.0776	-0.478**
	(0.164)	(0.157)	(0.162)	(0.219)	(0.174)	(0.203)
Municipality controls	No	Yes	No	No	No	Yes
Individual controls	No	No	Yes	No	No	Yes
Firm controls	No	No	No	Yes	No	Yes
Locality controls	No	No	No	No	Yes	Yes
Observations	606235	606235	606235	479017	606235	479017
R^2	0.000	0.000	0.001	0.045	0.000	0.049
ymean	3.860	3.860	3.860	2.129	3.860	2.129

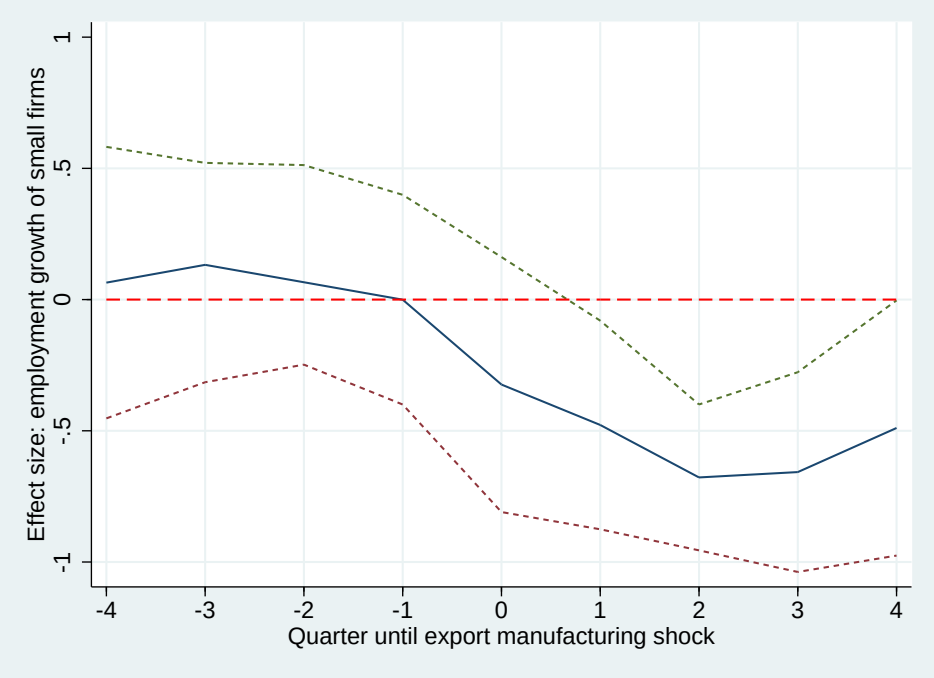
Standard errors in parentheses

This table reports regression of 100× employment growth in the self-employed's firms on predicted, future (by one period) quarterly export manufacturing employment difference in the local municipality. Unit of observation are inviduals from 40 quarterly ENOE waves 2005-2014 who are self-employed, and who are observed in the following period. Municipal export employment variables are normalised per 1000 working-age-population of the corresponding month and municipality, and employment and outcome variables are winsorised at the top and bottom 0.01%. Two-way clustered standard errors by municipality and trimester. Municipality controls include wave dummies, state dummies, and 2005 export manufacturing employment. Individual controls include gender, education level, and experience quadratic. Firm control include firm size bins, and profits. Locality controls include locality size category. All specifications include a constant, and ENOE sampling weights are used.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

FIGURE 6

THE TIMING OF ENTREPRENEURIAL RESPONSES TO EXPORT SHOCKS



Source: Results from regression of model 15, using the specification reported in Column (6) of Table 7. Horizontal axis documents the number of quarters s that the dependent variable has been shifted. Reported 95 % confidence intervals use two-way clustered standard errors by municipality and trimester.

TABLE 8

EFFECT OF EXPORT SHOCK ON INVESTMENT - 2008

	(1)	(2)	(3)	(4)	(5)	(6)
F. Δ_4 Pred. XME/WAP	-6.267	-523.4***	33.26	11.89	18.74	-350.4**
	(31.60)	(168.6)	(27.32)	(22.86)	(32.90)	(145.4)
Municipality controls	No	Yes	No	No	No	Yes
Individual controls	No	No	Yes	No	No	Yes
Firm controls	No	No	No	Yes	No	Yes
Locality controls	No	No	No	No	Yes	Yes
Observations	14058	14058	14058	11128	14058	11128
R^2	0.000	0.017	0.072	0.155	0.003	0.195
ymean	7012.7	7012.7	7012.7	7156.2	7012.7	7156.2

Standard errors in parentheses

This table reports regression of annual investment in small firms on predicted annual export manufacturing employment difference in the local municipality. Unit of observation are inviduals from ENAMIN wave in quarter 4 of 2008, who reported being self-employed in the same ENOE wave. Municipal export employment variables are normalised per 1000 working-age-population of the corresponding month and municipality, and employment and outcome variables are winsorised at the top and bottom 0.05%. Standard errors clustered by municipality Municipality controls include wave dummies, state dummies, and 2005 export manufacturing employment. Individual controls include gender, education level, and experience quadratic. Firm control include firm size bins, and initial capital stock. Locality controls include locality size category. All specifications include a constant, and ENAMIN sampling weights are used.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

TABLE 9

Effect of export shock on investment - 2010/12

	(1)	(2)	(3)	(4)	(5)	(6)
F. Δ_4 Pred. XME/WAP	84.60**	-19.27	25.09	65.34*	34.09	-9.586
	(39.12)	(40.54)	(32.30)	(33.62)	(36.70)	(36.77)
Municipality controls	No	Yes	No	No	No	Yes
Individual controls	No	No	Yes	No	No	Yes
Firm controls	No	No	No	Yes	No	Yes
Locality controls	No	No	No	No	Yes	Yes
Observations	40487	40487	40487	31567	40487	31567
R^2	0.000	0.008	0.059	0.120	0.003	0.157
ymean	4468.6	4468.6	4468.6	4341.2	4468.6	4341.2

Standard errors in parentheses

This table reports regression of annual investment in small firms on predicted future annual export manufacturing employment difference in the local municipality. Unit of observation are inviduals from ENAMIN waves in quarter 4 of 2010 and 2012, who reported being self-employed in the same ENOE wave. Municipal export employment variables are normalised per 1000 working-age-population of the corresponding month and municipality, and employment and outcome variables are winsorised at the top and bottom 0.05%. Standard errors clustered by municipality Municipality controls include wave dummies, state dummies, and 2005 export manufacturing employment. Individual controls include gender, education level, and experience quadratic. Firm control include firm size bins, and initial capital stock. Locality controls include locality size category. All specifications include a constant, and ENAMIN sampling weights are used.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

TABLE 10

EFFECT OF EXPORT SHOCK ON INVESTMENT BY FIRM SIZE - 2008

	(1)	(2) FS 0	(3) FS 1	(4) FS 2-3	(5) FS 4-5
F. Δ_4 Pred. XME/WAP (FS = 0)	-358.8**	-233.7**			
	(140.2)	(117.3)			
F. Δ_4 Pred. XME/WAP (FS = 1)	-396.3**		-1475.2		
	(176.9)		(899.8)		
F. Δ_4 Pred. XME/WAP (FS $\in [2,3]$)	-311.5			134.6	
	(193.4)			(807.7)	
F. Δ_4 Pred. XME/WAP (FS $\in [4,5]$)	316.7				-1824.7
	(251.0)				(3528.5)
F. Δ_4 Pred. XME/WAP (FS $\in [6,10]$)	-1181.3				
	(1528.5)				
Observations	11128	8880	1256	788	169
R^2	0.198	0.115	0.187	0.223	0.552
ymean	7156.2	4835.5	11213.3	23251.8	36358.8

Standard errors in parentheses

This table reports reg regression of annual investment on predicted future annual export manufacturing employment difference in the local municipality. The table explores the effects separately by firm size in number of paid workers (indicated in column header). Insufficient degrees of freedom for separate regression of firm size 6-10 ($N = 28$). Unit of observation are inviduals from ENAMIN waves in quarter 4 of 2008, who reported being self-employed in the same ENOE wave. Municipal export employment variables are normalised per 1000 working-age-population of the corresponding month and municipality, and employment and outcome variables are winsorised at the top and bottom 0.05%. Standard errors clustered by municipality Municipality controls include wave dummies, state dummies, and 2005 export manufacturing employment. Individual controls include gender, education level, and experience quadratic. Firm control include firm size bins, and initial capital stock. Locality controls include locality size category. All specifications include a constant, and ENAMIN sampling weights are used.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

TABLE 11

EFFECT OF EXPORT SHOCK ON OCCUPATIONAL CHOICE - HETEROGENEITY I

	(1) 05/07	(2) 08/09	(3) 10/14	(4) City	(5) Town	(6) Village	(7) Rural
Δ Pred. XME/WAP	0.0273	0.0999*	0.306	0.168***	0.0561	0.278	0.0569
	(0.115)	(0.0545)	(0.197)	(0.0450)	(0.0774)	(0.201)	(0.144)
Municipality controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Locality controls	Yes	Yes	Yes	No	No	No	No
Observations	202438	121595	271253	361587	84136	78785	70778
R^2	0.045	0.059	0.054	0.043	0.055	0.066	0.078
ymean	16.89	17.43	17.76	18.79	16.77	15.95	15.58

Standard errors in parentheses

This table reports regression of leaving self-employment for a wage job on predicted quarterly export manufacturing employment difference in the local municipality. The table explores heterogeneity of effects by time period and by size of locality of residence: 05/07, 08/09 and 10/14 refers to outcomes observed in the respective years. *City* refers to localities with over 100k population, *Town* to 15-100k population, *Village* to 2.5-15k population, and *rural* to less than 2,500 population. Unit of observation are inviduals from 40 quarterly ENOE waves 2005-2014 (or a subset of waves in columns (1)-(3)) who are self-employed, and who are observed in the following period. Municipal export employment variables are normalised per 1000 working-age-population of the corresponding month and municipality, and employment and outcome variables are winsorised at the top and bottom 0.01%. Two-way clustered standard errors by municipality and trimester. Municipality controls include wave dummies, state dummies, and 2005 export manufacturing employment. Individual controls include gender, education level, and experience quadratic. Firm control include firm size bins, and profits. Locality controls include locality size category (omitted in columns (4)-(6)). All specifications include a constant, and ENOE sampling weights are used.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

TABLE 12

EFFECT OF EXPORT SHOCK ON ENTREPRENEURIAL CHOICE - HETEROGENEITY I

	(1) 05/07	(2) 08/09	(3) 10/14	(4) City	(5) Town	(6) Village	(7) Rural
F.Δ Pred. XME/WAP	-0.580	-0.424	-0.811	-0.888***	0.143	0.781	0.819
	(0.465)	(0.282)	(0.731)	(0.138)	(0.843)	(0.594)	(0.523)
Municipality controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Locality controls	Yes	Yes	Yes	No	No	No	No
Observations	167110	100779	211128	288087	68163	64574	58193
R^2	0.031	0.071	0.066	0.039	0.051	0.119	0.148
ymean	3.229	1.162	1.813	3.479	1.969	0.0573	0.461

Standard errors in parentheses

This table reports regression of 100× employment growth in the self-employed's firms on predicted future quarterly export manufacturing employment difference in the local municipality. The table explores heterogeneity of effects by time period and by size of locality of residence: 05/07, 08/09 and 10/14 refers to outcomes observed in the respective years. *City* refers to localities with over 100k population, *Town* to 15-100k population, *Village* to 2.5-15k population, and *Rural* to less than 2,500 population. Unit of observation are inviduals from 40 quarterly ENOE waves 2005-2014 (or a subset of waves in columns (1)-(3)) who are self-employed, and who are observed in the following period. Municipal export employment variables are normalised per 1000 working-age-population of the corresponding month and municipality, and employment and outcome variables are winsorised at the top and bottom 0.01%. Two-way clustered standard errors by municipality and trimester. Municipality controls include wave dummies, state dummies, and 2005 export manufacturing employment. Individual controls include gender, education level, and experience quadratic. Firm control include firm size bins, and profits. Locality controls include locality size category (omitted in columns (4)-(6)). All specifications include a constant, and ENOE sampling weights are used.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

TABLE 13

EFFECT OF EXPORT SHOCK ON OCCUPATIONAL CHOICE - HETEROGENEITY II

	(1) Male	(2) Female	(3) Primary	(4) Secondary	(5) Tertiary
Δ Pred. XME/WAP	0.107**	0.221*	0.138*	0.122**	0.127
	(0.0470)	(0.113)	(0.0771)	(0.0500)	(0.126)
Municipality controls	Yes	Yes	Yes	Yes	Yes
Individual controls	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes
Locality controls	Yes	Yes	Yes	Yes	Yes
Observations	365869	229417	227535	277868	87408
R^2	0.046	0.030	0.057	0.056	0.033
ymean	21.34	11.40	16.13	18.60	17.52

Standard errors in parentheses

This table reports regression of probability of leaving self-employment for a wage job on predicted quarterly export manufacturing employment difference in the local municipality. The table explores heterogeneity of effects by time period and by gender and highest level of education completed. Unit of observation are inviduals from 40 quarterly ENOE waves 2005-2014 who are self-employed, and who are observed in the following period. Municipal export employment variables are normalised per 1000 working-age-population of the corresponding month and municipality, and employment and outcome variables are winsorised at the top and bottom 0.01%. Two-way clustered standard errors by municipality and trimester. Municipality controls include wave dummies, state dummies, and 2005 export manufacturing employment. Individual controls include gender (omitted in columns (1)-(2)), education level, and experience quadratic. Firm control include firm size bins, and profits. Locality controls include locality size category (omitted in colums (4)-(6)). All specifications include a constant, and ENOE sampling weights are used.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

TABLE 14

EFFECT OF EXPORT SHOCK ON ENTREPRENEURIAL CHOICE - HETEROGENEITY II

	(1) Male	(2) Female	(3) Primary	(4) Secondary	(5) Tertiary
F.Δ Pred. XME/WAP	-0.721**	-0.0738	0.0637	-0.845***	-0.866
	(0.284)	(0.0794)	(0.186)	(0.267)	(1.309)
Municipality controls	Yes	Yes	Yes	Yes	Yes
Individual controls	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes
Locality controls	Yes	Yes	Yes	Yes	Yes
Observations	281667	197350	185909	220787	70252
R^2	0.048	0.067	0.104	0.079	0.026
ymean	3.359	0.441	0.492	1.866	9.025

Standard errors in parentheses

This table reports regression of 100× employment growth in the self-employed's firms on predicted future quarterly export manufacturing employment difference in the local municipality. The table explores heterogeneity of effects by time period and by gender and highest level of education completed. Unit of observation are inviduals from 40 quarterly ENOE waves 2005-2014 who are self-employed, and who are observed in the following period. Municipal export employment variables are normalised per 1000 working-age-population of the corresponding month and municipality, and employment and outcome variables are winsorised at the top and bottom 0.01%. Two-way clustered standard errors by municipality and trimester. Municipality controls include wave dummies, state dummies, and 2005 export manufacturing employment. Individual controls include gender (omitted in columns (1)-(2)), education level, and experience quadratic. Firm control include firm size bins, and profits. Locality controls include locality size category (omitted in colums (4)-(6)). All specifications include a constant, and ENOE sampling weights are used.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix

A Parametric assumptions in model simulations

I assume very standard functional forms. The production function is assumed to be Cobb-Douglas, with only capital as an input. The utility function is CRRA. The wage distribution is log-normal. Search frictions are binary variables that necessarily follow a Bernoulli distribution with a unique parameter, the mean λ. I maintain these functional forms throughout:

$$\pi(k) = A \cdot k^{\alpha} \tag{A1}$$

$$u(c) = \frac{u^{1-\theta}}{1-\theta} \tag{A2}$$

$$\ln w \sim N(\mu_w, \sigma_w^2) \tag{A3}$$

I also maintain the parameter values chosen for the initial simulation, and only vary the mean of the log-wage distribution:

TABLE A1

Parametric assumptions in model simulations

Figure	2a	2b	A1 (solid)	A1 (dash-dot)	A1 (dash)
β	0.95	0.95	0.95	0.95	0.95
θ	1.5	1.5	1.5	1.5	1.5
A	1.6	1.6	1.6	1.6	1.6
α	0.5	0.5	0.5	0.5	0.5
μ_w	2	2	1.6	2	2.2
σ_w	0.2	0.2	0.2	0.2	0.2
λ	0	0.7	0.7	0.7	0.7

B When should we expect multiple equilibria?

Intuitively, as we move up the distribution of k_1, two opposing forces on asset accumulation are at play. On the one hand, the marginal utility of capital decreases at higher levels of capital (and income). On the other hand, higher incomes imply that more and more potential wage offers become unattractive, thus the likelihood of shutting down the firm decreases. As a result, the effective discount factor increases. When the second channel dominates, it creates a convex 'dent' in the law of motion of capital, such as depicted in Figure 4. As k_1 increases even further, the rate at which wages stop being attractive decreases because the

density of wages around the reservation wage becomes very small. Eventually, wages cannot keep up with business profits, and the reservation wage rises above the highest wage in the market. Discounting now only occurs with β, and the firm is on the same equilibrium path that would occur in isolation.

As a result, the model can sustain both a low-asset, low-income equilibrium with a high probability of shutdown and exit to wage employment, and a high-asset, high-income equilibrium with a zero probability of a voluntary shutdown.
Convexities in the law of motion of assets are a necessary, but not a sufficient condition for multiple equilibria to occur. In this section I provide further insight and discussion into both kind of conditions for multiple equilibria.

Recall from the discussion above that the law of motion becomes convex when the discount factor channel dominates the diminishing marginal utility channel. This also can be seen in equations (9) and (12). We can see that such a situation obtains most easily when the slope of the effective discount factor is steep.[32] All else being equal, the location of the wage offer distribution in relation to business profits determines this slope.

Figure A1 shows the three possible cases that can arise when the law of motion is locallly convex. The right-hand panel documents the corresponding wage distributions. If wage densities pick up at initial asset levels sufficiently *below* the steady state, then a local convexity may simply push up the investment profile towards a higher equilibrium path, without triggering multiple equilibria. In a sense, the firm changes course with its investment policy at a stage before the eventual target (the steady state capital stock) has been reached. This scenario is drawn in red solid lines. The policy function quickly converges to the investment profile that would arise in isolation, a reference point drawn as a thin dotted line.

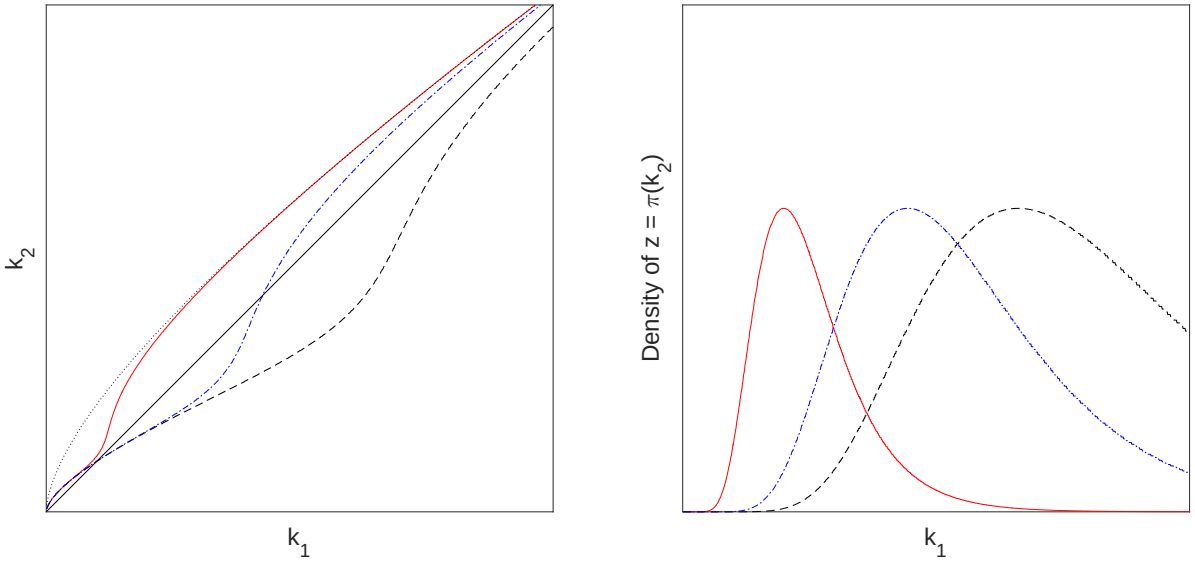
If instead, wage densities pick up *beyond*, but sufficiently close to, a steady state, then multiple equilibria can arise. This is the constellation of Figure (2), and is repeated here for comparison, again drawn in blue with a dashed-dotted line. Under this scenario, the changing endogenous probability of shutdown – and the changing effective discount factor – as k_1 increases lead firms to revise their investment policies *above* the low capital steady state. If the revision of investment is strong enough, capital accumulates again (when the law of motion crosses above the 45 degree line) and converges to a second, higher steady state.

Finally, if wage densities pick up at initial assets far beyond the steady state, firms react in a manner similar to the second case, and slow down the decline in their capital stock. However, if this occurs at high levels of k_1 where capital stock already decreases rapidly, this revision of policy may not be strong enough such as to lead to a new expansion of capital stock. This scenario is draw in dashed black lines.

[32] In addition, a convexity is also more likely when the utility and production functions are relatively flat. Then, the derivatives $u'()$, $u''()$, $\pi'()$ and $\pi''()$ are all relatively small in absolutely value. This makes it more likely for the positive summand, the discount factor channel to dominate in (9).

FIGURE A1

CONVEXITIES WITH AND WITHOUT MULTIPLE EQUILIBRIA



(a) Laws of motion

(b) Wage densities

Note that as we move up the initial asset distribution, the 'dents' in the laws of motion that convexities create become more and more pronounced, even though wage densities increase more slowly with the reservation wage. This illustrates the observation that the investment profile is more likely to turn convex when marginal productivity and utilities themselves are flatter. By implication, convexities are most likely to be found in precisely the kind of scenario that results in multiple equilibria - in the shallow parts of the policy function beyond the first steady state.

C Additional Tables and Figures

TABLE A2

EFFECT OF EXPORT SHOCK ON TRANSITION RATES - FORMAL/INFORMAL SPLIT

		(1) To NPE	(2) To Formal	(3) To Informal	(4) To SE
From NPE	Δ Pred. XME/WAPop	-0.0441	0.0803***	-0.0254	-0.0107
		(0.0241)	(0.0213)	(0.0281)	(0.0140)
	Observations	27920	27920	27920	27920
	Mean transition rate	83.44	3.261	7.571	5.722
From Formal WE	Δ Pred. XME/WAPop	-0.0220	0.0520	-0.0227	-0.00721
		(0.0198)	(0.0335)	(0.0311)	(0.0170)
	Observations	24278	24278	24278	24278
	Mean transition rate	5.709	83.78	8.585	1.921
From Informal WE	Δ Pred. XME/WAPop	0.0255	0.221**	-0.331***	0.0846
		(0.0506)	(0.0701)	(0.0965)	(0.0553)
	Observations	26575	26575	26575	26575
	Mean transition rate	19.25	12.82	59.11	8.823
From SE	Δ Pred. XME/WAPop	-0.0150	0.0625**	0.0290	-0.0765
		(0.0595)	(0.0309)	(0.0321)	(0.0629)
	Observations	26904	26904	26904	26904
	Mean transition rate	18.90	3.638	11.06	66.39

Standard errors in parentheses

This table reports regression of transitions (in percentage points, rowwise) on Bartik instrument, in first differences. Unit of observation is an unbalanced panel of Mexican municipalities (apart from D.F.) over 39 quarters from 2005 to 2010 (2005Q1 only used for calculating first difference). All employment variables are normalised per initial 1000 working-age-population of the corresponding trimester and municipality, and winsorised at the top and bottom 0.05%. All specifications include a constant, and per standard control for state, trimester, 2005 export employment. Individual controls are municipal average levels of education, experience, and share of men. Locality controls are locality size distribution within municipality. Observations are weighted by working-age population. Standard errors clustered by municipality.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

TABLE A3

EFFECT OF EXPORT SHOCK ON EMPLOYMENT RATES

	(1) Δ NPE	(2) Δ SE	(3) Δ WE	(4) Δ Formal	(5) Δ Formal XM	(6) Δ Informal
Δ Pred. XME/WAPop	-0.0549***	-0.00123	0.0557***	0.0594***	0.0501***	-0.00340
	(0.00876)	(0.00879)	(0.0128)	(0.0143)	(0.00652)	(0.00758)
Observations	39723	39723	39723	39723	39723	39723
R^2	0.020	0.054	0.035	0.015	0.012	0.021
ymean	-0.0381	-0.0138	0.0522	0.0313	0.0114	0.0211

Standard errors in parentheses

This table reports regression of employment shares (in percentage points) on Bartik instrument, in first differences. Note that formal and informal employment are nested within wage employment, and that export manufacturing employment (XME) is nested within formal wage employment. Unit of observation is an unbalanced panel of Mexican municipalities (apart from D.F.) over 39 quarters from 2005 to 2010 (2005Q1 only used for calculating first difference). All employment variables are normalised per initial 1000 working-age-population of the corresponding trimester and municipality, and winsorised at the top and bottom 0.05%. All specifications include a constant, and per standard control for state, trimester, 2005 export employment. Individual controls are municipal average levels of education, experience, and share of men. Locality controls are locality size distribution within municipality. Observations are weighted by working-age population. Standard errors clustered by municipality. *NPE* = not in paid employment.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

TABLE A4

Effect of export shock on propensity to leave SE for a wage job

	(1) Leave SE to WE	(2) Leave SE to WE	(3) Leave SE to WE	(4) Leave SE to WE	(5) Leave SE to WE	L
Δ Pred. XME/WAP	0.196	0.109***	0.210*	0.226	0.126	
	(0.130)	(0.0305)	(0.119)	(0.144)	(0.112)	
Municipality controls	No	Yes	No	No	No	
Individual controls	No	No	Yes	No	No	
Firm controls	No	No	No	Yes	No	
Locality controls	No	No	No	No	Yes	
Observations	756827	756827	756827	595286	756827	
R^2	0.000	0.010	0.038	0.000	0.001	
ymean	17.71	17.71	17.71	17.43	17.71	

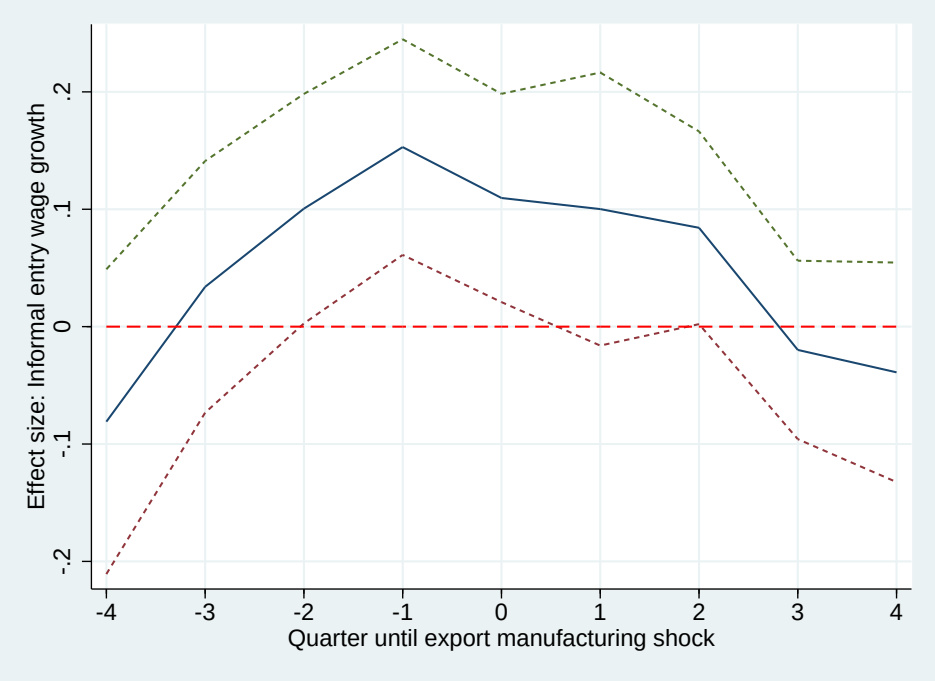
Standard errors in parentheses

This table reports regression of probability of leaving self-employment for a wage job on predicted quarterly export manufacturing employment difference in the local municipality. Unit of observation are inviduals from 40 quarterly ENOE waves 2005-2014 who are self-employed, and who are observed in the following period. Municipal export employment variables are normalised per 1000 working-age-population of the corresponding month and municipality, and employment and outcome variables are winsorised at the top and bottom 0.01%. Two-way clustered standard errors by municipality and trimester. Municipality controls include wave dummies, state dummies, and 2005 export manufacturing employment. Individual controls include gender, education level, and experience quadratic. Firm control include firm size bins, and profits. Locality controls include locality size category. All specifications include a constant, and ENOE sampling weights are used.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

FIGURE A2

TIMING OF INFORMAL ENTRY WAGE ADJUSTMENTS TO EXPORT SHOCKS



Source: Results from regression of log changes of wages paid to new entrants into informal wage employment on predicted XME changes per working-age population at different lags and leads, using the specification reported in Column (6) of Table 5. Horizontal axis documents the number of quarters s that the dependent variable has been shifted. Reported 95 % confidence intervals use two-way clustered standard errors by municipality and trimester.

TABLE A5

EFFECT OF EXPORT SHOCK ON INVESTMENT BY FIRM SIZE - 2010/12

	(1)	(2) FS 0	(3) FS 1	(4) FS 2-3	(5) FS 4-5	(6) FS 6-10
F. Δ_4 Pred. XME/WAP (FS = 0)	-40.08*	-9.995				
	(21.42)	(18.48)				
F. Δ_4 Pred. XME/WAP (FS = 1)	42.50		-88.58			
	(158.8)		(222.1)			
F. Δ_4 Pred. XME/WAP (FS $\in [2,3]$)	209.9			351.8		
	(354.9)			(492.7)		
F. Δ_4 Pred. XME/WAP (FS $\in [4,5]$)	2729.0***				-2594.2	
	(934.5)				(1594.5)	
F. Δ_4 Pred. XME/WAP (FS $\in [6,10]$)	-2589.2*					3313.6
	(1389.7)					(3425.1)
Observations	31567	26457	2924	1615	366	200
R^2	0.162	0.053	0.126	0.136	0.484	0.483
ymean	4341.2	2461.2	9044.2	18499.2	31539.1	49021.1

Standard errors in parentheses

This table reports reg regression of annual investment on predicted future annual export manufacturing employment difference in the local municipality. The table explores the effects separately by firm size in number of paid workers (indicated in column header). Unit of observation are inviduals from ENAMIN waves in quarter 4 of 2010 and 2012, who reported being self-employed in the same ENOE wave. Municipal export employment variables are normalised per 1000 working-age-population of the corresponding month and municipality, and employment and outcome variables are winsorised at the top and bottom 0.05%. Standard errors clustered by municipality Municipality controls include wave dummies, state dummies, and 2005 export manufacturing employment. Individual controls include gender, education level, and experience quadratic. Firm control include firm size bins, and initial capital stock. Locality controls include locality size category. All specifications include a constant, and ENAMIN sampling weights are used.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$